MINERALS YEARBOOK

Area Reports: International 2010

Latin America and Canada

Volume III

DEC 19 2012

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U.S. Department of the Interior
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Latin America and Canada

Volume III

U.S. DEPARTMENT OF THE INTERIOR
KEN SALAZAR, Secretary

U.S. GEOLOGICAL SURVEY
Marcia K. McNutt, Director

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 2012

Manuscript approved for publication on July 23, 2012.

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Suggested citation:
U.S. Geological Survey, 2012, Area Reports—International—Latin America and Canada: U.S. Geological Survey Minerals Yearbook 2010, v. III, 206 p.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
Fax: (202) 512-2104 Mail: Stop IDCC; Washington, DC 20402-0001

ISBN 978 1 4113 3175 4

Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2010 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Marcia K. McNutt, Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the Internet at http://www.usgs.gov or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, Global Minerals Analysis Section, National Minerals Information Center (NMIC), at (703) 648-7732, or the NMIC secretary at (703) 648-4961. Additional minerals information may be accessed on the Internet at http://minerals.usgs.gov/minerals.

Acknowledgments

The Country Specialists in the National Minerals Information Center, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the National Minerals Information Center.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

John H. DeYoung, Jr.
Director, National Minerals Information Center

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THE MINERAL INDUSTRIES OF LATIN AMERICA AND CANADA

By Susan Wacaster, Philip M. Mobbs, David R. Wilburn, Glenn J. Wallace, Steven T. Anderson, Omayra Bermúdez-Lugo, Alfredo C. Gurmendi, and Alberto Alexander Perez

The Latin America and Canada region reported upon in this volume is composed of about 50 countries and dependencies. These countries and dependencies have a combined population of approximately 624 million people and a land area of 30.5 million square kilometers. The Netherlands Antilles, which had been an autonomous country of the Kingdom of the Netherlands composed of Bonaire, Curacao, Sint Maarten, Saba, and Sint Eustatius, was dissolved in 2010 (Aruba had seceded from the Netherlands Antilles in 1986). As a result of the dissolution of the Netherlands Antilles, Curacao and Sint Maarten joined Aruba and the Netherlands as autonomous countries within the Kingdom of the Netherlands and Bonaire, Saba, and Sint Eustatius became special municipalities of the Netherlands (table 2).

In 2010, Brazil, Canada, and Chile maintained their positions as leaders in the global mineral industry. Brazil was the world's leading producer of niobium and tantalum, the third ranked producer of iron ore (gross weight), and the regional leader in the production of bauxite and crude steel. Canada was the world's leading producer of potash, the second ranked producer of niobium, and the regional leader in the production of aluminum, palladium, platinum, and tellurium. Chile was the world's leading producer of copper (mine output and refined metal), iodine, and lithium; the second ranked producer of arsenic; and the third ranked producer of boron. Argentina, Bolivia, Mexico, and Peru were also among the world's leading producers of base and precious metals and industrial minerals. Argentina was the world's second ranked producer of boron, and Bolivia was the second ranked producer of antimony. Mexico was the second ranked producer of fluorspar and the fifth ranked producer of lead. Peru was the world's leading producer of silver, the second ranked producer of bismuth and copper, the fourth ranked producer of lead, and the region's leading producer of tin (mine and metal production) (tables 4–6, 8–14, 16, 18; Angulo, 2011a, b; Brooks, 2011a, b; Carlin, 2011a, b; Edelstein, 2011; Jaskula, 2011b; Jorgenson, 2011; Miller, 2011; Papp, 2011).

In the Caribbean area, Aruba was not a mining nation, but the Aruba oil refinery (owned by Valero Energy Corp. of Texas), which had been a regional supplier of petroleum derivatives, restarted operations in January 2011 after being idled in 2009. Jamaica was estimated to be the world's sixth ranked producer of bauxite. The Republic of Trinidad and Tobago was a crude oil and natural gas producer, and its economy was dependent upon the hydrocarbon sector. The Dominican Republic's nickel production, which was usually ranked about 11th globally, was insignificant in 2010 because of a shutdown between August 2008 and October 2010 at Xstrata Nickel of the United Kingdom's Falconbridge Dominicana C. por A. (Falcondo) operation in Bonao. The company had halted operations at the facility because of a combination of high energy costs and diminished market conditions.

Acknowledgments

The U.S. Geological Survey (USGS) acknowledges and thanks the following organizations for providing mineral production statistics, basic economic data, and exploration and mineral-related information:

- Argentina—Dirección Nacional de Minería;
- The Bahamas—Department of Statistics;
- Belize—Geology and Petroleum Department;
- Bolivia—Viceministerio de Minería y Metalurgia, Instituto Nacional de Estadistica (INE), Asociación Nacional de Mineros Medianos;
- Brazil—Departamento Nacional de Produção Mineral;
- Canada—Natural Resources Canada;
- Chile—Comisión Chilena de Cobre and Servicio Nacional de Geología y Minería;
- Colombia—Unidad de Planeación Minero Energética and Instituto Colombiano de Geología y Minería;
- Costa Rica—Dirección de Geología y Minas;
- Dominican Republic—Dirección General de Minería, and Servicio Geologico Nacional;
- Guatemala—Ministerio de Energía y Minas, Dirección General de Minería, and Departamento de Desarrollo Minero;
- Guyana—Guyana Geology and Mines Commission;
- Jamaica—Mines and Geology Division of the Ministry of Agriculture and Lands;
- Mexico—Servicio Geológico Mexicano and Secretaría de Economía;
- Nicaragua—Administració de Recursos Geológicos and Dirección de Minas;
- Peru—Ministerio de Energía y Minas; and
- Trinidad and Tobago—Ministry of Energy and Energy Affairs.

General Economic Conditions

Canada's economy, expressed in terms of the real gross domestic product (GDP), was estimated to have grown by 3.2% in 2010 compared with a 2.8% decrease in 2009. The country withstood the global economic crisis of 2008-9 relatively well despite a high degree of exposure to the United States' sluggish post-recession economy, Canada's troubled automobile and housing sectors, and declining prices for mineral commodities worldwide. The Organisation for Economic Co-operation and Development (OECD) attributed Canada's economic resilience to a relatively sound banking system, a less-leveraged corporate sector (industrial companies with more than one-third of their capitalization in the form of debt, as opposed to equity, are generally considered highly leveraged), and a relatively strong fiscal position with respect to that of the United States (table 2; Organization for Economic Co-operation and Development, 2012, p. 8, 20).

A 2011 sovereign fiscal responsibility index ranked Canada 11 out of 34 emerging and advanced countries based on fiscal space (amount of debt, as a percentage of the GDP, that a country could issue before reaching fiscal crisis), fiscal path (projection of the country's future level of debt), and fiscal governance (value based on a country's fiscal rules, transparency, and enforceability) (Comeback America Initiative, The, 2011).

The Government of Canada kept domestic demand high by implementing a stimulus program equal to 2% of the GDP per year in 2009–10, which was targeted at the credit, housing, and labor markets. Despite a slowdown in the third quarter of 2010, economic growth increased during the final months of the year owing partially to an increase in exports, which was attributed in part to recovery in the U.S. economy (International Monetary Fund, 2011, p. 11–12).

According to the Economic Commission for Latin America and the Caribbean, the GDP of the region increased by about 6% in 2010, which continued a trend of economic recovery that began in many of the region's countries in the second half of 2009. The GDP decreased by at least 5.4% in Haiti as a result of the January 2010 earthquake and by about 1.5% in Venezuela owing to decreased domestic demand, decreased oil exports, and electricity rationing during a drought in the first half of the year (table 2; Economic Commission for Latin America and the Caribbean, 2011, p. 41).

The Latin America and the Caribbean region's growth was attributed to increased private consumption, expanded private sector credit, low interest rates, increased real wages (with the exception of Venezuela), and domestic production levels that were quickly increased because of the large amount of idle installed capacity that had been easily brought back into production. Consumption also increased in countries that relied upon emigrant remittances as a source of financing for domestic demand (table 2; Economic Commission for Latin America and the Caribbean, 2011, p. 41–42).

According to the International Monetary Fund, emerging economies, including those in Latin America, generally grew faster than advanced economies in 2010 as the global economy continued to expand (albeit unevenly within regions). Latin America's relatively rapid rebound was attributed in part to China's influence on international business cycles. A 2011 global macroeconomic modeling study by the Inter-American Development Bank reported that China's share of trade with the Latin American countries investigated (Argentina, Brazil, Chile, Mexico, and Peru) had increased by nearly threefold since about 1995 and that China's growth affected Latin America's business cycle mostly through China's demand for mineral commodities (Economic Commission for Latin America and the Caribbean, 2011, p. 9; International Monetary Fund, 2011, p. vii, 3).

The study indicated that a decade-long commodity price boom (prior to 2008) might have inflated bilateral trade shares between China and Latin American countries and that China's exchange rate regime might have played a role in directing more Chinese business to Latin America. The conclusion, however, was that the long-run effect of a potential reduction in the GDP of China on the economies of Latin American countries had also increased by threefold since the mid-1990s whereas the long-run effect on Latin America of a reduction in the GDP of the United States had decreased by one-half during the same period (Economic Commission for Latin America and the Caribbean, 2011, p. 41–42).

The study further concluded that the effect on other countries of a reduction of GDP originating in Latin America (or the rest of emerging Asia, excluding China and India) had not changed during the same period and that the effect of a reduction of China's GDP on Latin America would owe as much to indirect effects associated with stronger trade linkages between China and Latin America's leading trade partners (the United States and the euro area) as to direct effects that stemmed from tighter trade linkages between China and Latin America (Cesa-Bianchi and others, 2011, p. 1–6, 18–22).

In most Latin American countries, the highest rates of year-on-year GDP growth were in the first half of 2010. In most countries, excluding Chile and Venezuela, economies continued to grow during the second half of 2010 but at a slower rate. In Chile, slower growth in the first half of the year was primarily owing to the economic effect of the February 2010 earthquake that paralyzed many industries in the affected area and resulted in a decrease in the volume of exported goods. Chile's economy picked up during the second half of the year as some of the affected industries rebuilt and resumed activity, and the improvement was expected to continue into 2011. In Venezuela, the rate of economic growth increased in the second half of the year as the average price for the country's crude oil rose, which increased Government revenue and fiscal spending, and as the supply of electricity returned to normal (Economic Commission for Latin America and the Caribbean, 2011, p. 41–42).

Investment Data and Political Risk

From the start of 2010, the countries external to the region of Latin America and the Caribbean generally had increased liquidity compared with that of 2009. This widespread increase in liquidity was attributable in part to the programs in the United States to expand its liquidity during the second half of the year. That fact, combined with decreased risk levels (measured in terms of the premiums on 5-year credit-default swap contracts) of selected Latin American countries, including Brazil, Chile, Colombia, Mexico, Panama, and Peru, enhanced the attraction to the region as an investment destination. The region received somewhat increased net inflows of external financing, which included both foreign direct investment (FDI) and portfolio investment inflows (plus growth in the external resources raised by private-sector corporations), from 1.6% of the regional GDP in 2009 to 1.8% of the regional GDP in 2010. Most of the increased inflow of investment in the region went to countries that were more integrated into external financial markets and were bond issuers, including Brazil, Chile, Mexico, Peru and, to a lesser extent, Colombia. The external account balances of some Central American and Caribbean countries, which had used FDI as a primary source for persistent current account deficit financing, revealed the continued economic fragility of certain countries owing to both external factors and domestic difficulties (Economic Commission for Latin America and the Caribbean, 2011, p. 56).

In Latin America, gross fixed capital investment increased by 9.9% in 2010 compared with that of 2009 owing to increased investment in machinery and equipment (primarily imported), national currency appreciation, widely available credit, and higher capacity utilization rates along with greatly increasing demand. Gross fixed capital as a percentage of the GDP increased in 2010 compared with that of 2009 in Argentina, Bolivia, Brazil, Chile, the Dominican Republic, Ecuador, Haiti, Honduras, Panama, Paraguay, Peru, and Uruguay. The investment rate in some of the countries of Latin America exceeded 25%, but that of the majority of countries was between about 15% and 25%.

The Chilean Copper Study Center (CESCO) projected that investments in the Latin American mineral industry will total $327 billion in the period between 2011 and 2020. Investment values (including all investments in mining, but excluding investments in energy and exploration) were estimated to be distributed as $75 billion in Chile, $58 billion in Brazil, $56 billion in Peru, $22 billion in Colombia, $13 billion in Mexico, $10 billion in Argentina, $7 billion in Ecuador, and $4 billion in Panama, with the remainder presumably distributed among other nations of Latin America. The outlook was attributed in part to the rise of the emerging countries' share of the world GDP, which had risen from about 20% in 2003 to about 30% in 2010 and was projected to reach about 40% by 2016 (Centro de Estudios del Cobre y la Mineria, 2011, p. 5; Henriquez, 2011).

As a result of increased domestic demand, the import volume of goods and services increased by about 21% for the region, but the volume of net exports decreased. Exports had increased in terms of value in the region's mineral exporting countries (and some hydrocarbon-exporting countries), but this was primarily owing to higher export prices rather than export volumes. Exports from Brazil, however, rose because of an increase in the export volume of commodities in general and manufactured goods. The export volume decreased in Venezuela because of declining oil production (Economic Commission for Latin America and the Caribbean, 2011, p. 43).

Rising international prices for raw materials led to a significant increase in national revenue for net mineral commodity exporting countries compared with revenue in 2009, but that worsened the terms of trade for the countries that were net importers of fuel, such as some Central American countries. Emigrant remittances were recovering in several countries and increased in the Dominican Republic and El Salvador compared with those of 2009.

Chinese investment in Latin America increased in 2010 as Chinese companies secured interests in some large late-stage mineral projects. China was the third ranked investor in Latin America in 2010 and invested greater than $15 billion (or about 9% of China's total FDI) in the region, more than 90% of which was directed to the extractive industries. More than one-half of China's investment in natural resources had been directed to Latin America and was concentrated on more than 30 projects, primarily in South America. For the period 2003–11, Brazil (24%) and Peru (10%) were the first and fourth ranked global destinations for Chinese investment, respectively (of those countries for which data were available). In terms of the value of China's investment in the mineral industries of the countries of Latin America, Brazil was by far the leading recipient with about $11.5 billion, followed by Peru ($4.9 billion), Guyana ($1 billion), Argentina ($47 million), Venezuela ($15 million), Colombia ($10 million), and Bolivia ($2 million). For that same period, 59% of Chinese FDI in South America was accounted for by metals and 4% was accounted for by coal, crude oil, and natural gas combined (Kotschwar and others, 2012, p. 22).

The Government of China had loaned greater than $32 billion to the Government of Venezuela since 2007 for infrastructure and oil projects in the Orinoco tar sand; Venezuela planned to pay off its debt in oil at cut-rate prices. The Orinoco tar sand was estimated to contain greater than 500 billion barrels of recoverable heavy crude and could represent the world's largest oil petroleum reserve. It was reported that Venezuela sent about 460,000 barrels per day (about 20% of its oil exports) to China in recent years and that there were concerns that the arrangement could drive Venezuela into bankruptcy. The loans (some $23 million of which had gone unaccounted for) were criticized by some as reflecting poor management, and the legality of the loans had been brought into question. In 2010, the Chinese Government along with the China Development Bank (CDB) loaned $1 billion to the Ecuadorian Government in exchange for petroleum deliveries just 2 months after the Ecuadorian Government and the Export Import Bank of China signed a $1.7 billion deal to finance a hydroelectric project in Ecuador. Because of previous defaults on international debt by Ecuador and Venezuela, gaining access to such large amounts of capital would have been extremely difficult had they not been able to obtain financing from China, because virtually no lending opportunities would have been available elsewhere (Jacob, 2010; Hearn, 2012; Kotschwar and others, 2012, p. 3, 21).

The International Monetary Fund outlook for 2011 predicted that the Canadian economy would grow by 2.8%, but risks to that growth included the increase in domestic household debt (much of which had been incurred during the stimulus period) and a slow recovery of the U.S. economy. The risk of higher international prices for crude oil in 2011 was a concern globally but was expected to be potentially beneficial for Canada in the short term because the country was a net oil exporter; the short-term benefit could be offset by the negative effect of higher oil prices on global economic growth and, therefore, the Canadian dollar. Concern regarding the possibility of a worsening European sovereign debt crisis, which began to unfold in 2009 and intensified in 2010, was also seen as a potential source of weakened external demand that could slow economic growth in Canada in 2011 (International Monetary Fund, 2011, p. vii, 3, 11–12).

The deteriorating sovereign debt situation in Europe had not been a significant problem for Latin America through 2010. It was thought, however, that if the situation continued to devolve in 2011, that lending from banks in the euro area, which accounted, on average, for one-quarter of the banking assets in the larger Latin American countries, could be diminished and trigger a credit crunch in Latin America (Eyzaguirre, 2012).

High inflation rates and excess production capacity were risks in some emerging economies owing to favorable external financial conditions, macroeconomic stimulus policies in some countries that had not been normalized after the economic crisis of 2008–9 and were thus still in effect, and improving terms of trade for some countries. Global economic growth risks that were a concern for 2011 in Latin America included uncertainty in petroleum supply and high petroleum prices that could force prices for other mineral commodities exported from Latin America to decline (Economic Commission for Latin America and the Caribbean, 2011, p. 9; International Monetary Fund, 2011, p. vii, 3).

Legislation

Argentine lawmakers approved a law in 2010 that restricts mining and industrial activity on Andean glacial fields. A similar law was approved in 2008 but was vetoed by the President, who had indicated she would not veto the 2010 legislation. Barrick Gold Corp. of Canada, which was developing the Pascua Lama gold-silver-copper project at an elevation above 3,800 meters in the Andes Mountains between Argentina and Chile, indicated that the legislation would not affect development of the project (Hill, 2010).

Both houses of the Chilean legislature had approved a bill to increase the mining royalty rates from the current rate of 4% to 5% of product revenue. The bill initially set a royalty of between 4% and 9% of product revenue on a sliding scale through 2012, returning to the current rate of 4% to 5% from 2013 through 2017, and then moving to a sliding scale of 5% to 14% from 2018 through 2023. The bill needed to be signed into law before the legislation could become effective (Russo, 2010).

In 2010, much of Canada's legislation was aimed at stimulating the country's economy. The 2010 Federal budget extended the temporary 15% Mineral Exploration Tax Credit for another year to March 2011 as a means of maintaining revenues generated by the high level of mineral exploration investment in the country. The program applied to preliminary exploration activities conducted at or above the ground surface. The Canadian Government allocated about $12 million during a 2-year period to renew the Targeted Geoscience Initiative, with a focus on developing new methods for exploring deep mineral deposits. The budget provided about $11 million to streamline the review process for resource projects and decrease the regulatory burden (Kosich, 2010b).

At the Provincial level in Canada, the government of British Columbia announced a ban on mining and development activities in the Flathead Valley. In February 2010, the governor of Montana and the premier of British Columbia signed a memorandum of understanding (MOU) prohibiting future development of coal, gold, and oil and gas in southeastern British Columbia, north of Glacier National Park. The MOU also halted ongoing exploration in the area by several mining companies. Tax revenue-sharing agreements were signed during 2010 between the Provincial government and First Nations entities. The Quebec government implemented changes to the Province's mining tax. The new tax plan as reported in the 2010 Provincial budget in March increased the tax rate from 12% to 14% for the remainder of 2010, 15% for 2011, and 16% for 2012. For tax purposes, mine operators are now required to compute annual profit separately for each mine (Kosich, 2010a; Suarez, 2010; Testa, 2010).

Several Central American countries were restricting new mining projects. Costa Rican lawmakers voted in November 2010 to ban all new open pit mining projects. The Costa Rican President was expected to sign the bill into law, as she had previously placed a moratorium on mining after taking office in May 2010. The President of El Salvador had not approved new mining permits since 2008, and expressed interest in banning precious metal mining. Guatemala and Honduras were temporarily restricting new exploration and mining permits until new mining legislation has been passed (Josephs, 2010; Thomson Reuters, 2010).

Exploration

The estimated exploration budget for Latin America in 2010 [as determined by the Metals Economics Group (MEG) of Canada for nonferrous and nonfuel minerals, and excluding most industrial minerals] was about $2.9 billion (based on data from 2,213 companies), which accounted for about 27% of the estimated total world exploration budget. Recent discoveries in Argentina and Chile had directed exploration into areas where exploration costs are relatively high because of the remoteness of the area. Argentina, Brazil, Chile, Mexico, and Peru were included on the MEG's list of top 10 countries for anticipated exploration spending in 2010. On the basis of data compiled for this report, Latin American countries with the greatest exploration activity were, in descending order by number of sites for which data were compiled, Mexico, Brazil, Peru, Argentina, Chile, and Colombia. Gold attracted about 38% of total exploration activity; base metals, 29%; and silver, about 13%. Investment in 2010 was primarily used to further define early-stage resources (70%), conduct exploration at a producing site (14%), conduct feasibility studies of promising discoveries (11%), and further explore for resources of deposits under development (5%) (Metals Economics Group, 2010a, c).

Exploration activity in Mexico has focused on precious metal, base-metal, and polymetallic deposits. Gold is the primary product in about 61% of the currently active exploration projects in Mexico, and silver is the primary product in 28% of the active projects. Exploration for precious metal and polymetallic mineral deposits has increased as a result of the successful development and commissioning of the following four mines in Mexico during 2009 and 2010: the Palmarejo precious metal mine operated by Coeur d'Alene Mines Corp. of the United States, the Penasquito polymetallic mine operated by Goldcorp Inc. of Canada, the Pinos Altos precious metals mine operated by Agnico Eagle Mines Ltd. of Canada, and the San Francisco gold mine operated by Timmins Gold Corp. of Canada.

Canadian Government statistics on Canadian mineral exploration released by Natural Resources Canada as of December 2010 show revised 2010 exploration spending projections through the feasibility level at Can$2.8 billion (US$2.7 billion). Of this total, gold and silver were projected to account for about Can$1.5 billion; base metals, Can$499 million; uranium, Can$200 million, and diamond, Can$153 million. The December projections were 27% higher than the group's March 2010 estimate of Can$2.2 billion (US$2.1 billion), although these adjusted figures may reflect increased exploration costs rather than a greater amount of exploration activity. In contrast, the MEG reported budgeted exploration spending in Canada for 2010 at US$2.0 billion, which amounted to about 19% of the estimated overall worldwide exploration budget (Metals Economics Group, 2010). Canadian Government statistics as presented by Natural Resources Canada, however, included planned exploration expenditures for a wider variety of minerals and materials than were included in the MEG estimates. When the Canadian Government's exploration statistics are reconfigured to make them comparable with the MEG statistics, the planned exploration budgets as reported in December 2010 by Natural Resources Canada would be Can$2.35 billion (US$2.28 billion), or about 17% higher than the initial budget estimate reported by the MEG (Natural Resources Canada, 2010, 2011).

Company exploration budgets for 2010 as reported by the Canadian Government as of December 2010 were greatest in the Provinces of Ontario (29% of the total exploration and deposit appraisal spending intention for Canada), Quebec (20%), British Columbia (12.5%), and Saskatchewan (11%), and in Nunavut Territory (10%). The Canadian Provinces and Territories with a 50% or more increase in exploration activity in 2010 compared with that of 2009 were New Brunswick (241% increase, primarily as a result of increased base- and precious-metal exploration), Nova Scotia (161% increase, primarily as a result of increased exploration for base and precious metals, as well as other metals and nonmetals), Northwest Territories (124% increase, primarily as a result of increased exploration for base and precious metals and diamond), Alberta (102% increase, primarily as a result of increased exploration for industrial minerals and coal), Yukon Territory (73% increase, primarily as a result of increased exploration for gold and base metals), British Columbia (63% increase, primarily as a result of increased exploration for base and precious metals, as well as other metals and nonmetals), Ontario (54% increase, primarily as a result of increased exploration for diamond and precious metals), Quebec (52% increase, primarily as a result of increased exploration for base and precious metals, lithium, and rare-earth elements), and Nunavut Territory (50% increase, primarily as a result of increased exploration for base metals, diamond, and iron ore) (Natural Resources Canada, 2011).

Canadian Provinces and Territories with a decrease in exploration activity in 2010 from 2009 were Manitoba (12% decrease, primarily as a result of decreased exploration for precious metals) and Saskatchewan (3% decrease, primarily as a result of decreased exploration for coal and uranium). Junior exploration companies accounted for about 53% of total expenditures in 2010 compared with 61% in 2005, 65% in 2006, 67% in 2007, 65% in 2008, and 57% in 2009. In terms of mineral commodities being sought countrywide, precious metals received the largest exploration budget (53%), followed by base metals (18%), uranium and nonmetals (7%), and diamond (5%). Coal, iron ore, and other minerals made up the remaining 17% (Natural Resources Canada, 2011).

Based on MEG statistics, Canada's share of the world nonfuel minerals exploration budget was about 19%. In 2010, about 53% of all companies exploring in Canada were considered junior companies. The Canadian Provinces and Territories with the greatest exploration activity were, in descending order by number of active sites in 2010, Ontario, Quebec, British Columbia, Saskatchewan, Yukon Territory, Newfoundland, Nunavut Territory, Manitoba, Northwest Territories, Nova Scotia, New Brunswick, and Alberta. Based on the site data, exploration for gold accounted for approximately 46% of Canadian exploration in 2010; copper, about 14%; nickel and uranium, 6% each; lead and zinc combined and platinum-group metals, 4% each; and diamond, 3%. Exploration for lithium, potash, and rare-earth elements increased significantly in 2010.

Approximately 83% of all reported exploration sites were considered early-stage sites. Gold exploration in Canada (based on the number of active sites reporting activity in 2010) was focused on British Columbia, Ontario, Quebec, and Yukon Territory, and base-metal exploration was focused primarily on British Columbia, Manitoba, and Ontario. Uranium exploration took place primarily in Saskatchewan. Exploration for rare-earth elements took place primarily in British Columbia, Newfoundland, Northwest Territories, and Quebec. Potash exploration took place in Quebec and Saskatchewan. Exploration for lithium deposits took place in Nova Scotia, Ontario, and Quebec (Natural Resources Canada, 2011).

Commodity Overview

Metals

Aluminum and Bauxite and Alumina.—*Aluminum.*—World primary aluminum production increased by about 11% in 2010 compared with that of 2009. Canada was the leading producer of primary aluminum in the region, accounting for about 7% of the world's production. Latin America (primarily Brazil, but also including Argentina and Venezuela) accounted for about 6% of the world's primary aluminum metal production. Aluminum production was expected to increase in 2011, but demand and prices could affect production levels, depending on global economic trends as well as potentially rising fuel costs because aluminum production is energy intensive (tables 4, 6).

Statistical data from the International Aluminium Institute of the United Kingdom indicated that the average number of kilowatthours (kWh) required to produce 1 metric ton (t) of primary aluminum (that is, the power used for electrolysis and normal smelter auxiliaries up to the point where the liquid aluminum is tapped from the pots) had decreased from 16,951 kWh in 1980 to 16,093 kWh in 1990 and to 15,365 kWh in 2000; it was somewhat erratic in the 2000s (especially since 2005), and was at 15,496 kWh in 2010.

The energy sources used for production since 1980 have included coal, hydroelectric, natural gas, nuclear, and petroleum products. Hydroelectric power supplied between about 50% and 60% of the energy requirement for global primary aluminum production in 1980, 1990, and 2000, and about 65% by 2010. Coal supplied 25%, 34%, and 32% of the energy needed for global primary aluminum production in 1980, 1990, and 2000, respectively, but this percentage had decreased to 23% in 2010. In South America only, hydroelectric power supplied about 94% of the energy requirement for aluminum production in 1980, 97% in 1990, 92% in 2000, and 84% in 2010. Coal was not used as a power source in South America from 1980 through 2010, whereas the share of natural gas, which supplied 1.8% of that region's energy requirement for primary aluminum production in 1980, increased to 16% by 2010. The use of petroleum products for primary aluminum production decreased sharply both globally and in South America from about 10% of the global share in 1980 to 0.1% in 2010 and from about 4.5% of South America's share in 1980 to zero in 2010 (International Aluminium Institute, 2012).

Bauxite and Alumina.—Latin America accounted for about 24% of the world's production of bauxite in 2010, of which Brazil accounted for about 15%. Brazil was the leading regional producer, accounting for about 62% of the regional production. Other bauxite producing countries in the region included Guyana (less than 1% of world production), Jamaica (4%), Suriname (1.9%), and Venezuela (2.6%). An estimated 6% increase in global bauxite production in 2010 was attributed to reopened, new, and (or) expanded mines in the world, including in Brazil and Jamaica. Global alumina production increased by 14%. South America and the Caribbean were estimated to have 21% of the world's bauxite resources (table 4; Bray, 2011).

Copper.—*Ore.*—Production of copper ore in Latin America and Canada accounted for about 48% of the world output in 2010. The region was expected to increase its copper ore production capacity by about 18% by 2017 as production increases at existing operations and (or) new projects are commissioned in Argentina, Chile, Colombia, Ecuador, Mexico, and Peru. In 2010, however, Chile accounted for about 34% of global copper mine production [followed by Peru (7%) and Canada (3%)], and Chile's Escondida copper mine remained the world's leading copper producer. Production at Escondida Mine (majority owned by BHP Billiton plc of the United Kingdom) decreased slightly in 2010 to 1.09 million metric tons (Mt) of copper from 1.1 Mt in 2009 after maintenance work at its electrowinning plants caused a reduction in copper cathode production. Brazil was expected to increase its copper output by about 2015 with the commissioning of several projects, primarily in the State of Para where production increases could be about 250,000 metric tons per year (t/yr). Recent assessments of copper resources indicated 1.3 billion metric tons (Gt) of copper in discovered, mined, and undiscovered resources in the Andes Mountains of South America (tables 4, 8; Cunningham and others, 2008; Edelstein, 2011; Soto, 2011).

Refined Copper.—Chile was the world's leading producer of primary refined copper, and the country outpaced other producers in the region (including Bolivia, Brazil, Canada, Mexico, and Peru), accounting for 72% of the region's output. In 2010, Vale S.A. of Brazil, which had a 36% share of the refined copper market in Brazil, announced its intention to buy Paranapanema S.A., which was Brazil's leading copper refining company and its second ranked producer of copper semimanufactures. Vale failed to win a majority share in the company and withdrew from the deal. Upon announcing its intention to acquire a majority share of Paranapanema, however, Vale reported that one of its midterm objectives was to become a leading world copper producing company (it was already the world's leading iron ore producer). The company was developing two copper projects with startups scheduled in 2011; they were the Salobo project in Carajas, Brazil, with a production capacity of 100,000 t/yr, and the Tres Valles project in Chile, with a production capacity of 18,000 t/yr (tables 4, 9; Engineering and Mining Journal, 2010; Murphy, 2010).

Gold.—Latin America and Canada accounted for about 23% of the world's production of gold in 2010. Peru and Canada were the first and second ranked producers, respectively, in the region and together accounted for about 42% of regional production. Canada's production had declined since at least 2000, but was projected to increase by 2013 and to continue to do so for the foreseeable future thereafter, presuming the country's economy recovers sufficiently to allow for operations that were suspended during the global economic crisis to resume production and (or) new projects come online (tables 4, 10).

Peru's gold production decreased by about 13% in 2010 compared with that of 2009, primarily owing to lower grades being mined at the country's largest gold mine, Yanacocha [which was jointly owned by operator Newmont Mining Corp. of the United States (51.35%), Compania de Minas Buenaventura S.A.A. of Peru (43.65%), and the International Finance Corp. (5%)]. Buenaventura's most recent production unit, La Zanja [which was jointly owned by Buenaventura (53%) and Newmont (47%)] started production in September 2010 and was expected to produce about 3,000 kilograms per year of gold. Buenaventura also held a 40% interest in the Tanahuatay gold and silver project that was expected to produce about another 3,000 kilograms (kg) of gold and about 13,000 kg of silver annually (Engineering and Mining Journal, 2011).

Peru's second largest gold mine was Barrick Lagunas Norte Mine, which produced about 25,000 kg of gold in 2010. Barrick's other operation in Peru, Pierina Mine, had been expected to shut down in 2009, but operations were extended until 2014. Gold Fields Ltd. of South Africa operated the Cerro Corona gold-copper mine in Cajamarca. The operation reached full production in 2009 and produced about 500 kg of gold and 43,000 t of copper in 2010. Gold production from artisanal and small miners in the Madre de Dios area of southeastern Peru accounted for about 19,000 kg in 2010 (Engineering and Mining Journal, 2011).

Iron Ore and Iron and Steel.—*Iron Ore.*—Latin America and Canada accounted for about 16% of the world's iron ore output in terms of gross weight. In terms of iron content, Brazil continued to be the leading producer in the region, accounting for about 81% of the region's production of iron. In 2010, Brazil's iron ore reserves were increased following the discovery of a significant iron ore deposit in the southwestern State of Mato Grosso, which was reported to consist of an estimated 11.5 Gt of iron ore (grading 41% iron content) plus about 430 Mt of phosphates. The newly discovered deposit would reportedly dwarf the country's Carajas Mine, but the Carajas Mine had a higher grade ore (about 66% iron content). Development of the Mato Grosso discovery could cost hundreds of millions of dollars as the site is located in the interior of the country where there was no infrastructure for getting processed ores and products to the nearest ports (tables 4, 11; United Press International, 2010).

The government of Mato Grosso committed to provide financial assistance with infrastructure developments for Mato Grosso, and Brazil already had potential backers for other iron ore development projects, including the Government of China. China currently buys about 25 million metric tons per month of Brazilian iron ore (most of it from Vale, which was the world's leading iron ore exporter), and Brazil earned about $12.4 billion from iron ore and concentrates exports in the first 7 months of 2010 (United Press International, 2010).

Steel.—In 2010, Latin America and Canada accounted for 5% of the world's production of crude steel. Regionally, Brazil was the leading producer, accounting for 43% of the region's production, followed by Mexico (22%) and Canada (17%). By August 2010, steel mills globally were increasing their stockpiles of iron ore in anticipation of increased demand in late 2010 and into 2011 as the global recession appeared to be easing. Apparent world steel consumption increased by 13% in 2010.

Interest in Canada's iron ore supply was increasing among some steel producers that sought a competitive alternative to the three companies that controlled about two-thirds of the global iron ore trade market—Vale, Rio Tinto Group of the United Kingdom, and BHP Billiton. In 2010, those three global leaders ended their practice of annual price-setting of iron ore supplies in favor of a quarterly price-setting system that could cause significant variability in the price of iron ore, which is a steel producer's greatest expense.

Some industry analysts reported that steel companies would need to begin to invest in their own iron ore development projects to obtain a competitive edge in the iron ore market, and Canada, although ranked only 8th among global iron ore producers, was attracting investment to its large deposits of iron ore. Tata Steel of India, which was the world's seventh ranked steel producer, announced that it had exercised an option to acquire 80% interest in a joint venture with Canada's New Millennium Capital Corp. Tata Steel proposed to make a nearly $300 million investment that would allow the joint venture to develop the DSO Project (a direct-shipping ore project). Tata also was expected to evaluate investment in other lower grade iron ore (taconite) projects in Canada.

Platinum-Group Metals.—Canada and Colombia were the only countries to produce any platinum-group metals (PGM) in the region in 2010. Canada was the only palladium producer in the region, and it accounted for 78% of regional platinum production. The Lac des Isles palladium and platinum mine in Canada (owned by North American Palladium Ltd. of Toronto, Ontario) reopened in April 2010 after having been placed on care-and-maintenance status in October 2008 owing to low metal prices. Canada's production of both commodities had decreased by about 50% since that time. Other producers of PGM in Canada were Xstrata plc of Switzerland and Vale Ltd. of Canada. Both companies produced PGM as byproducts from their nickel mining operations in Sudbury (tables 4, 14).

Tin.—In 2010, Peru was the leading tin mine producer in the region, accounting for about 14% of the world production of tin ore, followed by Bolivia (8%) and Brazil (4%). Canada was not a tin producing country, but there were tin exploration projects underway in the country (tables 4, 15).

Zinc.—Peru was the leading zinc mine producer in the Latin America and Canada region in 2010, accounting for about 43% of regional production and 12% of total world production. Other producers in the region included Argentina, Bolivia, Brazil, Canada, Chile, Honduras, and Mexico. Peru's leading zinc mine, Antamina, which is a copper zinc mine, was jointly owned by BHP Billiton Ltd. of Australia, Xstrata, Teck Resources Ltd. of Canada, and Mitsubishi Corp. of Japan. In 2010, the owners announced a $1.2 billion expansion that would extend the life of the mine to at least 2029 and increase output by up to 40% once the expansion was concluded. Yukon Zinc Corp. of Canada commissioned the mill at its Wolverine zinc mine in 2010 and was expected to reach design capacity of 1,700 metric tons per day (t/d) in 2012. The current mine life was 9.5 years based on a 5.2 Mt deposit, and the operation was expected to produce, in order of volume, zinc, copper, and lead concentrates (table 4; Velez, 2009; Compania Minera Antamina, S.A., 2012; Yukon Zinc Corp., 2012).

Industrial Minerals

Diamond.—Canada was the only significant diamond mine producer in the Latin America and Canada region in 2010, accounting for 98% of the regional total. Other countries in the region that were minor producers included Brazil, Guyana, and Venezuela. Globally, Canada was the world's fourth ranked producer in terms of volume after Russia, Botswana, and Congo (Kinshasa), and was ranked third in terms of the value of production after Botswana and Russia. Canada's diamond mine production was expected to increase starting in 2011 until at least 2017 as the Jericho Mine, which had been on care-and-maintenance status since 2008, was expected to be restarted under new ownership, and as several new early-stage projects come online in 2013–16. The projected production would result in several additional thousand carats per year to the regional and global production totals (table 17; Kimberley Process, 2011).

Lithium.—In 2010, global production of lithium increased by 44% compared with that of 2009. The Latin America and Canada region accounted for about 70% of world production. Chile was the leading producer in the region, accounting for about 58% of the regional total, followed by Argentina (39%) and Brazil (3%) (table 18).

Argentina was the world's fourth ranked producer of lithium, and the country's Puna Plateau in northwestern Argentina was estimated to contain more than 80% of the world's lithium brine reserves. These evaporite brines, which are commonly referred to as salars, are an economical and plentiful source of lithium in aqueous solution that is pumped from aquifers (as well as being a source of commercially important boron and potassium) (Houston and others, 2011; Jaskula, 2011b).

The world's largest tonnages of lithium and potassium in brines are located in the Andes Mountains of Argentina, Bolivia, and Chile, and in western China and Tibet [Xizang] Autonomous Region. Recent developments in the automotive industry and other industries that use lithium in manufacturing led to an exploration boom within the salars of the central Andes, primarily because the brine bodies in China and Tibet have a more complex chemistry that makes recovery of the contained elements more difficult and less economical (Houston and others, 2011).

In 2010, at least a dozen brine projects were at various stages of development in Argentina. In December 2010, Rincon Lithium Ltd. (owned by The Sentient Group of the United Kingdom) commenced its operation at the Salar del Rincón. The company was expected to produce 10,000 t/yr of lithium carbonate, 4,000 t/yr of lithium hydroxide, and 3,000 t/yr of lithium chloride. Orocobre Ltd. of Australia entered into a joint-venture agreement with Toyota Tsusho Corp. of Japan, which was a key supplier to Toyota Motor Corp., Panasonic Corp., and Sanyo Electric Co. Ltd.; the aim was to secure low-cost lithium to supply their partners in the automotive and battery industries. Regional production was expected to increase by about 40% by 2017 (table 18; Houston and others, 2011; Jaskula, 2011a).

Mineral Fuels and Related Materials

Coal.—Colombia was the regional leader in coal production in 2010 (followed by Canada, Mexico, Venezuela, and Brazil); it accounted for about 40% of regional production and 1% of global production. The Colombian Government planned to seek up to $6.8 billion in private investment to expand production and increase the country's output of coal to about 150 Mt by 2020. The country was estimated to have about 24 Gt of coal reserves. Port capacity was expected to be increased to 151 million metric tons per year (Mt/yr) in 2019 from 80.6 Mt/yr. At yearend 2010, the total proven global reserves of coal were estimated to be about 860 Gt, of which the region composed of South and Central America accounted for just 1.5%, and almost all of which was anthracite and bituminous coal from Colombia. Canada accounted for about 0.8% of global coal reserves composed of about equal amounts of (1) anthracite and bituminous and (2) subbituminous and lignite (tables 4, 19; BP p.l.c., 2012, p. 30).

Uranium.—In 2010, Canada was the world's second ranked producer of uranium, accounting for about 18% of total global output. The country had 17 nuclear reactors connected to its power grid, and its deuterium reactors supplied about 15% of the country's electricity. France, which used about 12,000 t/yr of uranium oxide concentrate (10,500 t/yr of U), obtained about 4,500 t/yr of that supply from Canada. Cameco Corp. was Canada's top uranium producer, and most of the company's uranium came from the Athabasca basin in northern Saskatchewan and Alberta, which was the source of the world's highest grade uranium (Gordon, 2012; Natural Resources Canada, 2012; Organisation for Economic Co-operation and Development, 2012; World Nuclear Association, 2012).

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TABLE 1
THE AMERICAS: AREA AND POPULATION IN 2010

Country	Area[1] (square kilometers)	Estimated population[2] (thousands)
Antigua and Barbuda	443	88
Argentina	2,780,400	40,412
Aruba	180	107
Bahamas, The	13,880	342
Barbados	430	273
Belize	22,966	344
Bermuda	54	65
Bolivia	1,098,581	9,930
Brazil	8,514,877	194,946
Canada	9,984,670	34,109
Chile	756,102	17,114
Colombia	1,138,910	46,295
Costa Rica	51,100	4,659
Cuba	110,860	11,258
Dominica	751	68
Dominican Republic	48,670	9,927
Ecuador	283,561	14,465
El Salvador	21,041	6,193
Grenada	344	104
Guatemala	108,889	14,389
Guyana	214,969	754
Haiti	27,750	9,993
Honduras	112,090	7,601
Jamaica	10,991	2,702
Mexico	1,964,375	113,423
Montserrat	102	5 [1]
Nicaragua	130,370	5,788
Panama	75,420	3,517
Paraguay	406,752	6,455
Peru	1,285,216	29,077
Saint Kitts and Nevis	261	52
Saint Lucia	616	174
Saint Vincent and the Grenadines	389	109
Suriname	163,820	525
Trinidad and Tobago	5,128	1,341
United States[3]	9,826,675	309,051
Uruguay	176,215	3,357
Venezuela	912,050	28,834
Other[4]	104,121	5,469 [5]
Americas total	40,354,019	933,315
World total	148,940,000	6,840,507

[1] Source: U.S. Central Intelligence Agency, The World Factbook 2010.

[2] Source: The World Bank, 2011 World Development Indicators Database.

[3] Excludes Puerto Rico and U.S. Virgin Islands.

[4] Includes Anguilla, British Virgin Islands, Cayman Islands, Curacao, French Guiana, Guadeloupe, Martinique, Puerto Rico, Saint Barthelemy, Saint Martin, Sint Maarten, Turks and Caicos Islands, and U.S. Virgin Islands.

[5] Sources: L'Institut national de la statistique et des études économiques, Populations de 1975 à 2040–comparaisons départementales; U.S. Central Intelligence Agency, The World Factbook 2010; and The World Bank, 2011 World Development Indicators Database.

TABLE 2
THE AMERICAS: GROSS DOMESTIC PRODUCT[1,2]

	Gross domestic product based on purchasing power parity		Real gross domestic product growth rate (percentage)		
Country	Gross value (million dollars)	Per capita (dollars)	2008	2009	2010
Antigua and Barbuda	1,709	21,460	2.2	-9.6	-4.1
Argentina	644,301	15,901	6.8	0.8	9.2
Bahamas, The	10,353	30,049	-1.3	-5.4	1.0
Barbados	6,300	22,776	-0.2	-4.7	0.3
Belize	2,679	8,080	3.8	0.0	2.7
Bolivia	47,997	4,604	6.1	3.4	4.1
Brazil	2,178,530	11,273	5.2	-0.6	7.5
Canada	1,334,140	39,171	0.7	-2.8	3.2
Chile	258,536	15,040	3.7	-1.7	5.2
Colombia	436,588	9,593	3.5	1.5	4.3
Costa Rica	51,319	11,043	2.7	-1.3	4.2
Dominica	952	13,258	7.8	-0.7	0.3
Dominican Republic	87,508	8,860	5.3	3.5	7.8
Ecuador	115,753	7,828	7.2	0.4	3.6
El Salvador	43,042	7,340	1.3	-3.1	1.4
Grenada	1,366	13,110	2.2	-7.7	-1.4
Guatemala	70,466	4,907	3.3	0.5	2.8
Guyana	5,433	7,035	2.0	3.3	4.4
Haiti	11,466	1,163	0.8	2.9	-5.4
Honduras	33,731	4,194	4.1	-2.1	2.8
Jamaica	23,765	8,745	-0.9	-3.0	-1.2
Mexico	1,564,870	14,406	1.2	-6.2	5.4
Nicaragua	17,661	3,037	28.0	-1.5	4.5
Panama	44,492	12,615	10.1	3.2	7.5
Paraguay	33,340	5,208	5.8	-3.8	15.0
Peru	276,542	9,358	9.8	0.9	8.8
Saint Kitts and Nevis	892	16,192	5.7	-4.4	-1.5
Saint Lucia	2,071	12,507	5.8	-1.3	4.4
Saint Vincent and the Grenadines	1,237	11,542	-0.6	-2.3	-1.8
Suriname	4,725	8,951	4.7	3.1	4.4
Trinidad and Tobago	26,016	19,743	2.4	-3.5	-0.6
United States[3]	14,526,550	46,860	-0.3	-3.5	3.0
Uruguay	48,129	14,339	8.6	2.6	8.6
Venezuela	351,609	12,048	5.3	-3.2	-1.5
Americas total[4]	22,264,068	XX	XX	XX	XX
World total	74,384,980	XX	2.8	0.7	5.1

NA Not available. XX Not applicable.

[1] Source: International Monetary Fund, World Economic Outlook Database, September 2011.

[2] Gross domestic product listed may differ from that reported in individual country chapters owing to differences in source or date of reporting.

[3] Excludes Puerto Rico and U.S. Virgin Islands.

[4] Excludes Anguilla, Aruba, Bermuda, British Virgin Islands, Cayman Islands, Cuba, Curacao, French Guiana, Guadeloupe, Martinique, Montserrat, Puerto Rico, Saint Barthelemy, Saint Martin, Saint-Pierre & Miquelon, Sint Maarten, Turks and Caicos Islands, and U.S. Virgin Islands.

TABLE 3
SELECTED LATIN AMERICA AND CANADA EXPLORATION ACTIVITY IN 2010[1]

Location	Type[2]	Site	Commodity	Company	Resource[3,4]
Argentina	E	Cauchari-Olaroz	Li, Potash	Lithium Americas Corp.	5.3 Mt Li_2CO_3, 17.3 Mt KCl (D).
Do.	F	Don Nicholas	Au	Minera IRL Ltd.	202,000 oz Au (ID).
Brazil	F	Raicho dos Machados	Au	Carpathian Gold Inc.	813,000 oz Au (ID).
Do.	E	Volta Grande	Au	Belo Sun Mining Corp.	893,000 oz Au (ID).
Canada	F	Black River	Au	Sabina Gold & Silver Corp..	612,000 oz Au (ID).
Do.	E	Brewery Creek	Au	Golden Predator Corp.	145,000 oz Au (ID).
Do.	E	Capoose	Au, Ag	Silver Quest Resources Ltd.	700,000 oz Au, 41 Moz Ag (IF).
Do.	P	Casa Berardi	Au	Aurizon Mines Ltd.	914,000 oz Au (D).
Do.	E	Casino	Cu, Au, Mo, Ag	Western Copper Ltd.	2.1 Mt Cu, 9 Moz Au, 250,000 t Mo, 64 Moz Ag (D).
Do.	E	Comtois	Au	Maudore Minerals Ltd.	1.2 Moz Au (IF).
Do.	E	Courageous Lake	Au	Seabridge Gold Inc.	4.2 Moz Au (D).
Do.	F	Detour Lake	Au	Detour Gold Corp.	11.4 Moz Au (R).
Do.	E	Discovery	Au	North American Palladium Ltd.	237,000 oz Au (D).
Do.	E	Duparquet	Au	Osisko Mining Corp.	345,000 oz Au (D).
Do.	E	East Amphi	Au	Do.	164,000 oz Au (D).
Do.	E	Eastmain	Au	Eastmain Resources Inc.	256,000 oz Au (IF).
Do.	E	Fermont	Iron ore	Champion Minerals Inc.	141 Mt Fe (IF).
Do.	E	Frankfield	Au	Gowest Amalgamated Resources Ltd.	502,000 oz Au (IF).
Do.	E	Hackett River	Zn, Ag, Cu, Pb, Au	Sabina Gold & Silver Corp..	2 Mt Zn, 200 Moz Ag, 0.180 Mt Cu, 0.280 Mt Pb, 400,000 oz Au (ID).
Do.	E	Hammond Reef	Au	Brett Resources Inc.	6.7 Moz Au (IF).
Do.	E	Joanna	Au	Aurizon Mines Ltd.	1.7 Moz Au (D).
Do.	P	Lac Des Iles	Pd, Pt, Au, Ni, Cu	North American Palladium Ltd.	1.7 Moz Pd, 0.120 Moz Pt, 0.110 Moz Au, 12,000 t Zn, 9,500 t Cu (ID).
Do.	E	Lamaque	Au	Integra Gold Corp.	456,000 oz Au (IF).
Do.	E	Larder Lake	Au	Bear Lake Gold Ltd.	283,000 oz Au (D).
Do.	F	Legacy	Potash	Potash One Inc.	39 Mt potassium chloride (KCl) (D).
Do.	E	Midwest Northeast	U	Hathor Exploration Ltd.	3,000 t U_3O_8 (ID).
Do.	E	Nechalacho (Thor Lake)	REO, Zr, Nb, Ta, Ga	do.	0.5 Mt REO, 2.4 Mt ZrO_2, 0.326 Mt Nb_2O_5, 0.029 Mt Ta_2O_5, 0.010 Mt Ga (ID).
Do.	E	Phoenix	Au	Rubicon Minerals Corp.	4 Moz Au (IF).
Do.	E	Premier	Au, Ag, Zn	Ascot Resources Ltd.	140,000 oz Au, 520,000 oz Ag, 56,000 t Zn (R).
	E	Raglan (Goldbrook)	Ni, Cu, PGM	Goldbrook Ventures Inc.	Data not released.
Do.	E	Rainy River	Au, Ag	Rainy River Resources Ltd.	2.4 Moz Au, 3.3 Moz Ag (ID).
Do.	E	Rau	Au	ATAC Resources Ltd.	Data not released.
Do.	E	Silvertip	Ag, Zn, Pb, Au	Silvercorp Metals Inc.	27 Moz Ag, 221,000 t Zn, 158,000 t Pb, 41,000 oz Au (ID).
Do.	E	Springpole	Au	Gold Canyon Resources Inc.	242,000 oz Au (IF).

See footnotes at end of table.

TABLE 3—Continued

SELECTED LATIN AMERICA AND CANADA EXPLORATION ACTIVITY IN 2010[1]

Location	Type[2]	Site	Commodity	Company	Resource[3, 4]
Canada—Continued	E	Thunder Bay North	Pt, Pd, Rh, Au, Ag, Cu,	Magma Metals Ltd.	0.33 Moz Pt, 0.31 Moz Pd, 15,000 oz Rh, 20,000 oz Au, 0.495 Moz Ag, 25,000 t Cu, 17,000 t Ni, 1,400 t Co (D).
Do.	D	Timmins	Au	Lake Shore Gold Corp.	812,000 oz Au (ID).
Do.	E	White Gold	Au	Kinross Gold Corp.	1 Moz Au (ID).
Chile	E	Arqueros	Ag, Au	Laguna Resources NL	18 Moz Ag, 72,000 oz Au (ID).
Do.	E	Caspiche	Au, Ag, Cu	Exeter Resource Corp.	21 Moz Au, 48 Moz Ag, 2.4 Mt Cu (D).
Do.	E	El Espino	Cu, Au	Explorator Resources Inc.	815,000 t Cu, 947,000 oz Au (D).
Do.	P	Quebrada Blanco	Cu	Teck Resources Ltd.	679,000 t Cu (R).
Do.	E	Volcan	Au	Andina Minerals Inc.	9.8 Moz Au (D).
Do.	E	West Wall	Cu, Au, Mo	Xstrata plc.	4 Mt Cu, 1.2 Moz Au, 75,000 t Mo (IF).
Colombia	E	Buritica	Au	Continental Gold Ltd.	Data not released.
Do.	E	Marmato	Au, Ag	Medoro Resources Ltd.	7.5 Moz Au, 48 Moz Ag (D).
Ecuador	E	Condor	Au, Ag	Kinross Gold Corp.	5.7 Moz Au, 7.3 Moz Ag (D).
Guatemala	E	Escobal	Ag, Ag, Pb, Zn	Tahoe Resources Inc.	246 Moz Ag, 0.251 Moz Au, 0.122 Mt Pb, 0.205 Mt Zn (ID).
Do.	E	Mayaniquel	Ni	Anfield Nickel Corp.	270,000 t Ni (ID).
Mexico	E	Cerro Jumil	Au, Ag	Esperanza Silver Corp.	910,000 oz Au, 1.9 Moz Ag (D).
Do.	E	Cordero	Ag, Zn, Au, Pb	Levon Resources Ltd.	Data not released.
Do.	P	El Castillo	Au	Argonaut Gold Inc.	752,000 oz Au (R).
Do.	E	El Gallo	Ag, Au	US Gold Corp.	25 Moz Ag, 21,000 oz Au (D).
Do.	P	Mulatos	Au	Alamos Gold Inc.	1.7 Moz Au (R).
Do.	F	San Antonio	Au	Pediment Gold Corp.	1.2 Moz Au (D).
Do.	P	San Francisco	Au	Timmins Gold Corp.	611,000 oz Au (R).
Do.	E	San Jose de Gracia	Au, Ag	Goldgroup Mining Inc.	310,000 oz Au, 500,000 oz Ag (IF).
Do.	E	Santana	Au	Corex Gold Corp.	Data not released.
Nicaragua	P	La Libertad	Au	B2Gold Corp.	510,000 oz Au (R).
Peru	E	Cerro Ccopane	Iron ore	Cuervo Resources Inc.	26 Mt Fe (D).
Do.	E	Haquira	Cu, Mo, Au, Ag	Antares Minerals Inc.	3.2 Mt Cu, 50,000 t Mo, 500,000 oz Au, 20 Moz Ag (D).
Do.	E	Inmaculada	Au, Ag	Hochschild Mining plc.	530,000 oz Au, 16 Moz Ag (ID).
Do.	E	Zafranal	Cu, Au	AQM Copper Corp.	1.4 Mt Cu, 774,000 oz Au (R).

[1] Abbreviations used in this table for commodities are as follows: Ag, silver; Au, gold; Co, cobalt; Cu, copper; Fe, iron ore; Ga, gallium; Li, lithium; Mo, molybdenum; Nb, niobium; Ni, nickel; Pb, lead; PGM, platinum-group metals; Pd, palladium; Pt, platinum; REO, rare-earth oxides; Rh, rhodium; Ta, tantalum; U, uranium; Zn, zinc; Zr, zirconium.

[2] D, approved for development; E, active exploration; F, feasibility work ongoing/completed; P, exploration at producing site.

[3] Abbreviations used in this table for units of measurement are as follows: Moz, million troy ounces; Mt, million metric tons; oz, troy ounces; t, metric tons.

[4] Based on 2010 data reported from various sources: D, measured + indicated; ID, indicated; IF, inferred, R, proven + probable. Data not verified by U.S. Geological Survey.

TABLE 4
LATIN AMERICA AND CANADA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2010[1]

(Thousand metric tons unless otherwise specified)

	Metals									
	Aluminum				Iron and steel					
Country	Bauxite	Metal, primary	Copper, mine output, Cu content	Gold, Au content (kilograms)	Iron ore, gross weight	Steel, crude	Lead, mine output, Pb content	Nickel, mine output, Ni content	Silver, mine output, Ag content (metric tons)	Tin, mine output, Sn content (metric tons)
Argentina	--	413	140	63,138	--	5,138	23	--	723	--
Bolivia[p]	--	--	2	6,394	--	--	73	--	1,259	20,190
Brazil[p]	31,700	1,535	214	62,047	372,120	33,033	20	109	37	10,400
Chile	--	--	5,419	39,494	9,130	1,011	1	--	1,287	--
Colombia	--	--	4	53,606	77	1,213	--	70 [e]	15	--
Costa Rica	--	--	--	--	--	--	--	--	--	--
Cuba	--	--	--	--	--	278	--	71 [e]	--	--
Dominican Republic	--	--	9	500	--	60 [e]	--	--	20	--
Ecuador	--	--	--	1,300 [e]	--	372	--	--	1 [e]	--
El Salvador[e]	--	--	--	--	--	56	--	--	--	--
French Guiana[e]	--	--	--	2,000	--	--	--	--	--	--
Guatemala	--	--	--	9,213	2	274	--	--	195	--
Guyana	1,100	--	--	9,594	--	--	--	--	--	--
Honduras	--	--	(2) [e]	2,197	--	--	17	--	49	--
Jamaica[e]	8,540	--	--	--	--	--	--	--	--	--
Mexico	--	--	238	72,596	13,998	16,710	192	--	4,411	--
Nicaragua	--	--	--	2,065	--	--	--	--	6,995	--
Panama[e]	--	--	--	870	--	--	--	--	--	--
Paraguay[e]	--	--	--	--	--	63 [3]	--	--	--	--
Peru[p]	--	--	1,094	164,060	9,160	750 [e]	262	--	3,640	33,848
Suriname[e]	4,000	--	--	12,286 [3]	--	--	--	--	--	--
Trinidad and Tobago	--	--	--	--	--	572	--	--	--	--
Uruguay[e]	--	--	--	1,736 [3]	16	66	--	--	--	--
Venezuela[e]	5,500	355	--	12,000	14,900	5,000	--	20	--	--
Other[e, 4]	--	--	--	--	--	--	--	--	--	--
Total	50,800	2,300	7,120	515,000	419,000	64,600	587	270	18,600	64,400
Share of world total	24%	6%	45%	20%	16%	4%	14%	15%	60%	26%
Canada[p]	--	2,963	525	91,024	37,001	13,003	65	158	596	--
Share of world total	--	7%	3%	4%	1%	1%	2%	9%	2%	--
United States	NA	1,730	1,110	231,000	49,900	80,500	369	--	1,280	--
Share of world total	NA	4%	7%	9%	2%	6%	9%	--	4%	--
Total Western Hemisphere	50,800	6,990	8,750	837,000	506,000	158,000	1,020	429	20,500	64,400
Share of world total	24%	17%	55%	33%	19%	11%	24%	24%	66%	26%
World total	216,000	40,900	15,800	2,560,000	2,600,000	1,440,000	4,170	1,790	30,900	251,000

See footnotes at end of table.

TABLE 4—Continued
LATIN AMERICA AND CANADA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2010[1]

(Thousand metric tons unless otherwise specified)

	Metals—Continued	Industrial minerals				Mineral fuels and related materials				
							Natural gas		Petroleum	
Country	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic	Gypsum	Phosphate rock, P_2O_5 content	Salt	Coal, all grades	Dry (million cubic meters)	Plant liquids (thousand 42-gallon barrels)	Crude, including condensate (thousand 42-gallon barrels)	Refinery products (thousand 42-gallon barrels)
Argentina	32,566	10,000 ^{e}	1,347	NA	1,527	140	NA	10,000 ^{e}	222,436	275,390
Bolivia^{p}	411,409	2,414	1	--	45 ^{e}	--	14,923	3,022	12,607	11,900 ^{e}
Brazil^{p}	211,203	59,066	2,750	2,179	7,030	6,500	22,938	9,570	752,253	726,700
Chile	27,662	3,871	758	3 ^{e}	7,695	619	1,793	NA ^{e}	1,536	67,131
Colombia	--	10,000 ^{e}	--	--	654	74,350	11,300	--	286,890	112,570
Costa Rica	--	2,500 ^{e}	--	--	--	--	--	--	--	--
Cuba	--	1,631	111	--	272	--	1,073	--	19,507	6,642
Dominican Republic	--	3,200	195	--	50 ^{e}	--	--	--	--	13,000 ^{e}
Ecuador	--	5,000 ^{e}	--	--	--	--	600 ^{e}	300 ^{e}	177,374	50,716
El Salvador^{e}	--	1,200	--	--	--	--	--	--	--	6,200
French Guiana^{e}	--	62	--	--	--	--	--	--	--	--
Guatemala	--	1,500 ^{e}	59	--	50 ^{e}	(2)	(2)	--	4,363	473
Guyana	--	--	--	--	--	--	--	--	--	--
Honduras	36,370	1,800 ^{e}	--	--	40 ^{e}	--	--	--	--	--
Jamaica^{e}	--	740	230	--	19	--	--	--	--	299,000
Mexico	570,004	34,503	3,560	452	8,430	27,565	33,632	137,605	940,240	428,513
Nicaragua	--	530 ^{e}	20	--	30 ^{e}	--	--	--	--	5,500 ^{e}
Panama^{e}	--	1,700	--	--	17	--	--	--	--	--
Paraguay^{e}	--	600	5	--	--	--	--	--	--	2,660
Peru^{p}	1,470,450	8,100	321	17 ^{e}	1,570	92	2,251	30,963	33,759	74,620
Suriname^{e}	--	65	--	--	--	--	--	--	5,700	2,940
Trinidad and Tobago	--	784 ^{e}	--	--	--	--	44,565	17,222	33,665	46,167
Uruguay^{e}	--	620	1,150	--	--	--	--	--	--	15,300
Venezuela^{e}	--	11,000	7	115	350	7,500	24,900	78,500	985,500	434,000
Other$^{e, 4}$	--	1,040	--	--	1,249 ^{3}	--	12	--	1,814	40,567 ^{3}
Total	2,760,000	162,000	10,500	2,770	29,000	117,000	158,000	287,000	3,480,000	2,620,000
Share of world total	23%	5%	8%	5%	11%	2%	5%	11%	13%	9%
Canada^{p}	648,905	12,431	2,717	210 ^{e}	10,537	67,876	144,378	230,000	990,000	730,000 ^{e}
Share of world total	5%	(2)	2%	(2)	4%	1%	5%	9%	4%	3%
United States	748,000	67,200	8,840	7,400	43,300	985,000	611,000	757,000	2,000,000	4,570,000
Share of world total	6%	2%	7%	13%	3%	14%	20%	28%	7%	16%
Total Western Hemisphere	4,160,000	242,000	22,100	10,400	82,900	1,170,000	913,000	1,270,000	6,470,000	7,920,000
Share of world total	34%	7%	17%	19%	36%	16%	29%	47%	24%	28%
World total	12,100,000	3,360,000	132,000	55,900	274,000	7,280,000	3,120,000	2,700,000	27,400,000	28,400,000

See footnotes at end of table.

TABLE 4—Continued

LATIN AMERICA AND CANADA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2010[1]

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[e] Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. [p] Preliminary. NA Not available. -- Zero or zero percent.

[1] Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of February 3, 2012.

[2] Less than 1/2 unit.

[3] Reported figure.

[4] Includes Aruba, Barbados, Belize, Curacao, Guadeloupe, Haiti, Martinique, Saba, Sint Eustatius, and Sint Maarten.

TABLE 5
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 2000–2017[1]

(Thousand metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Brazil	13,800	22,034	31,700	32,000	32,000	32,000
Dominican Republic	--	535	--	--	--	--
Guyana	2,471	1,648	1,100	2,100	2,100	2,100
Jamaica	11,100	14,116	8,540	11,000	11,000	11,000
Suriname	3,610	4,757	4,000	5,000	5,000	5,000
Venezuela	4,360	5,900	5,500	5,500	5,500	5,000
Total	35,300	49,000	51,000	55,600	55,600	55,100

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 6
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PRIMARY AND SECONDARY ALUMINUM PRODUCTION, 2000–2017[1]

(Thousand metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	278	270	400	400	400	400
Brazil	1,487	1,749	1,787	2,000	2,500	2,500
Canada[2]	2,521	3,070	3,000	3,600	3,900	3,900
Mexico	348	574	700	700	700	700
Venezuela	571	615	355	500	500	500
Total	5,200	6,300	6,200	7,200	8,000	8,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes secondary aluminum production.

TABLE 7
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED COBALT MINE PRODUCTION, 2000–2017[1]

(Metal content in metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Brazil	900	1,500	1,500	1,500	1,500	1,500
Canada	5,298	5,767	4,568	7,000	9,000	9,000
Cuba	2,852	4,798	3,600	3,600	4,400	4,400
Total	9,000	12,000	9,700	12,000	15,000	15,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 8

LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 2000–2017[1]

(Metal content in thousand metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	145	187	140	200	300	300
Bolivia	1	1	2	2	2	2
Brazil	32	133	214	240	250	260
Canada	634	595	525	640	640	650
Chile	4,602	5,321	5,419	5,700	5,900	6,000
Colombia	10	9	4	7	7	7
Ecuador	--	--	--	6	6	6
Mexico	365	429	238	320	350	350
Peru	554	1,010	1,094	1,350	1,400	1,450
Total	6,300	7,700	7,600	8,500	8,900	9,000

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 9

LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED REFINED COPPER PRODUCTION, 2000–2017[1]

(Thousand metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina[2]	16	16	16	--	--	--
Bolivia	--	--	1	2	2	2
Brazil	233	224	233	250	260	270
Canada	613	515	319	370	370	370
Chile[3]	2,668	2,824	3,244	3,400	3,400	3,400
Mexico	411	416	278	360	390	390
Peru[3]	452	512	394	450	500	550
Total	4,400	4,500	4,500	4,800	4,900	5,000

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[2] Secondary only.

[3] Primary only.

TABLE 10
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 2000–2017[1]

(Au content in kilograms)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	26,000	27,904	63,138	60,000	60,000	60,000
Belize	7	(2)	--	--	--	--
Bolivia	12,000	8,871	6,394	4,000	4,000	4,000
Brazil	50,400	38,293	62,047	65,000	65,500	66,000
Canada	156,200	120,541	91,024	105,000	100,000	110,000
Chile	54,100	40,447	39,494	45,000	60,000	70,000
Colombia	37,000	35,783	53,600	55,000	55,000	55,000
Costa Rica	50	424	--	--	--	--
Cuba	1,000	--	--	--	--	--
Dominican Republic	--	--	500	25,000	25,000	25,000
Ecuador	2,870	5,338	4,600	5,000	6,000	6,000
French Guiana	3,492	1,955	2,000	2,000	2,000	2,000
Guatemala	140	741	9,213	10,000	10,000	10,000
Guyana	13,510	8,325	9,594	10,000	10,000	10,000
Honduras	878	4,438	2,197	1,500	1,500	2,000
Mexico	26,400	30,356	72,600	75,000	80,000	80,000
Nicaragua	3,670	3,674	4,900	3,000	3,000	3,000
Panama	--	--	--	2,000	2,000	
Peru	139,000	208,002	164,060	170,000	180,000	185,000
Suriname	300	10,619	12,286	12,500	13,000	13,500
Uruguay	2,180	3,151	1,736	2,000	2,300	2,500
Venezuela	7,330	10,480	12,000	12,000	12,500	13,000
Total	537,000	559,000	611,000	664,000	692,000	717,000

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[2] Less than 1/2 unit.

TABLE 11
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED IRON ORE PRODUCTION, 2000-2017[1]

(Fe content in thousand metric tons)

Country	Iron content	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	68%	--	--	--	500	500	500
Bolivia	65%	--	--	--	--	500	1,000
Brazil	66%	141,000	186,891	247,772	250,000	250,000	260,000
Canada[2]	64%	22,700	19,333	23,300	28,000	28,000	30,000
Chile	61%	5,400	4,707	5,852	7,000	8,000	9,000
Colombia	55%	363	325	77	200	300	300
Cuba	45%	9	9	--	--	--	--
Guatemala	65%	10	7	(3)	--	--	--
Mexico	60%	6,800	7,012	7,900	8,000	8,500	8,500
Peru	68%	2,810	4,565	6,140	6,500	7,000	7,000
Uruguay	50%	4	12	16	18	20	20
Venezuela	65%	11,100	13,000	15,200	16,000	16,500	16,500
Total	XX	190,000	236,000	306,000	320,000	320,000	333,000

[e] Estimated. XX Not applicable. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[2] Includes beneficiated and direct-shipping ore.

[3] Less than 1/2 unit.

TABLE 12
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 2000–2017[1]

(Thousand metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	4,470	5,386	5,138	5,700	5,700	5,700
Brazil	27,900	31,631	33,033	34,000	35,000	40,000
Canada	15,900	15,327	13,003	13,000	15,000	15,000
Chile	1,350	1,537	1,011	1,500	1,700	1,700
Colombia	660	842	1,213	1,300	1,300	1,300
Cuba	327	245	278	280	280	280
Dominican Republic	36	60	60	60	70	70
Ecuador	58	84	80	85	85	85
El Salvador	41	48	56	65	70	80
Guatemala	166	207	274	300	300	300
Jamaica	--	--	--	--	--	--
Mexico	15,600	16,202	16,710	17,000	19,000	20,000
Paraguay	77	101	90	140	150	150
Peru	749	750	750	750	750	750
Trinidad and Tobago	753	711	572	600	700	700
Uruguay	38	64	66	71	72	75
Venezuela	3,840	4,907	5,000	5,000	5,000	5,000
Total	72,000	78,100	77,300	80,000	85,000	91,200

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 13
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 2000–2017[1]

(Pt content in kilograms)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Canada	5,700	6,075	3,600	9,000	9,000	10,000
Colombia	339	1,082	997	1,200	1,200	1,200
Total	6,000	7,200	4,600	10,200	10,200	11,200

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 14
LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 2000–2017

(Pd content in kilograms)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Canada	10,400	10,400	6,200	15,000	15,000	19,000

[e] Estimated; estimated data are rounded to no more than three significant digits.

TABLE 15

LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED TIN MINE PRODUCTION, 2000–2017[1]

(Sn content in metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	4	1	--	1	1	1
Bolivia	12,293	18,640	20,190	20,000	23,000	24,000
Brazil	14,200	11,739	10,400	12,000	14,000	14,500
Peru	70,901	42,145	33,848	41,000	42,000	42,500
Total	97,400	72,500	64,400	73,000	79,000	81,000

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 16

LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED TIN METAL PRODUCTION, 2000–2017[1]

(Metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	--	120	--	150	150	150
Brazil	14,023	9,236	9,348	10,500	12,000	12,000
Bolivia	9,353	13,841	14,975	17,000	20,000	21,000
Mexico	1,200	17	--	--	--	--
Peru	37,410	36,733	36,451	39,500	40,000	40,000
Total	62,000	59,800	60,800	67,200	72,000	73,200

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 17

LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED DIAMOND MINE PRODUCTION, 2000–2017[1]

(Thousand carats)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Brazil	1,600	208	25	100	100	100
Canada	2,530	12,314	11,773	12,000	13,000	16,000
Guyana	82	357	50	180	200	200
Venezuela	110	115	115	115	115	115
Total	4,300	13,000	12,000	12,000	13,000	16,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 18

LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED LITHIUM PRODUCTION, 2000–2017[1]

(Li content in metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	25	2,800	3,200	4,200	4,200	4,200
Bolivia	--	--	--	--	50	90
Brazil	260	210	489	510	510	510
Canada	670	670	--	2,000	3,000	3,000
Chile	6,740	8,354	10,361	13,000	13,000	13,000
Total	7,700	12,000	17,800	22,500	24,600	24,600

[e] Estimated. -- Negligible or no production.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 19

LATIN AMERICA AND CANADA: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 2000-2017[1]

(Thousand metric tons)

Country	2000	2005	2010	2013[e]	2015[e]	2017[e]
Argentina	246	320	140	300	300	300
Brazil	6,000	6,480	6,310	6,500	6,850	6,850
Canada[2]	69,200	67,555	67,876	70,000	75,000	80,000
Chile	509	732	619	1,500	2,500	3,000
Colombia	38,200	59,064	74,350	85,000	85,000	100,000
Mexico[2]	14,300	11,750	27,565	30,000	32,000	32,000
Peru[2]	27	22	92	145	150	150
Venezuela	7,910	7,195	7,500	7,550	7,600	7,600
Total	136,000	153,000	184,000	200,000	209,000	230,000

[e] Estimated.

[1] Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

[2] Run of mine.

THE MINERAL INDUSTRY OF ARGENTINA

By Susan Wacaster

Argentina is a mineral rich country that produces and exports mineral commodities and raw materials. The value of production from the agriculture, fishing, forestry, hunting, and mining industries accounted for about 16% of the country's economy in 2010. The country has deposits of metals, including copper, gold, silver, and zinc; energy minerals, including natural gas, crude petroleum, and uranium; a wide variety of industrial minerals; and minerals that are important for numerous industrial and manufacturing applications, such as cadmium and lithium. The country was the world's leading producer and third ranked exporter of biofuels in 2010 (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 42).

The Deseado Massif is located in the southern Argentine Patagonia and makes up much of Santa Cruz Province. The Deseado Massif represents a horst and graben setting developed in the Paleozoic basement where overlying Jurassic volcanic rocks host widely distributed fracture-controlled gold- and silver-bearing quartz veins that locally contain base metals. The most important geologic feature of the area is an extensive plateau composed of intermediate to acid volcanic rocks of the Bahia Laura volcanic complex. There are more than 50 epithermal occurrences within the massif and four operational mines in Santa Cruz Province, including the Cerro Vanguardia, Manantial Espejo, Martha, and San Jose Mines (Schalamuk and others, 1997).

In 2010, Argentina was estimated to be the world's second ranked producer of boron and the fourth ranked producer of both lithium and strontium (from celestite). The Puna Plateau in northwestern Argentina was estimated to contain more than 80% of the world's lithium brine reserves. These evaporite brines (referred to as salars), which contain lithium in aqueous solutions that are pumped from aquifers, are an economical and plentiful source of lithium, as well as a source of commercially important boron and potassium. The largest tonnages of lithium and potassium in brines are located in the Andes Mountains of Argentina, Bolivia, and Chile, and in western China and the Tibet [Xizang] Autonomous Region. Recent developments in the automotive industry and other industries that use lithium in manufacturing have led to an exploration boom within the salars of the central Andes, primarily because the brine bodies in China and Tibet have a more complex chemistry that makes recovery of the contained elements more difficult and less economical. At least a dozen brine projects were at various stages of development in Argentina (Angulo, 2011a, b; Houston and others, 2011; Jaskula, 2011).

Minerals in the National Economy

In 2010, the economy of Argentina recovered to a growth rate approaching that of the years preceding the international economic downturn of 2008–9. The year-on-year estimated gross domestic product (GDP) growth rate was 7.1% in 2010 compared with just 0.9% in 2009, 6.8% in 2008, 8.7% in 2007, and 8.5% in 2006. The value contributed to the nominal GDP in 2010 from the production of goods increased by 33% compared with that of 2009. The mining and quarrying sector accounted for 3.3% of Argentina's total GDP (including goods and services) in 2010 compared with a slightly revised 3.4% in 2009. The mining sector (not including quarrying), however, accounted for 8.8% of the value contributed to the GDP in terms of the production of goods alone compared with 9.3% in 2009. The value contributed by other sectors of the economy that produced goods, including the construction sector; the sector composed of electricity, gas, and water; and the manufacturing sector, decreased by less than 1% compared with that of 2009 (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 18, 46, 51–52; Instituto Nacional de Estadística y Censos, 2011).

Argentina has a strong manufacturing sector. Manufacturing companies accounted for 60% of the country's top 500 nonfinancial companies in 2008 (the most recent year for which data were available); the mining and quarrying sector accounted for 8%; and the sector composed of electricity, gas, and water accounted for 7%. Foreign direct investment (FDI) into Argentina increased by 43% from 2003 through 2008 when it reached a record $9.7 billion, but in 2009, FDI decreased by nearly 60% to about 3.9 billion. Spain was the top source of FDI stock in 2009, representing 28% of the total, followed by the United States (17%), the Netherlands (9%), and Brazil and Chile (5% each). Companies from those five countries were also the leading foreign investors in Argentina from 2005 through 2009 (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 18, 46, 51–52; Instituto Nacional de Estadística y Censos, 2011).

Government Policies and Programs

Argentina's current Mining Code [El Codigo de Mineria] was enacted by the Argentine Congress on November 25, 1886. The Mining Code underwent significant revisions in 1993 with the enactment of law No. 22,224 (Mining Reorganization Law), and law No. 24,228 (Federal Mining Covenant); in 1995 with the enactment of law No. 24,498 (Mining Modernization Law), law No. 24,523 (creation of the National Mining Trade System of the Mining Secretariat), and law No. 24,585 (Environmental Protection Mining Law); and in 1997 with the passage of law No. 25,225 (modifications) (Secretaría de Minería de la Nación, 2011).

Argentina had not traditionally been a mining country. Mineral production was primarily focused on construction materials until about the 1990s. In 1992, the Government implemented a plan to open the mining sector to private investment, which resulted in a more favorable climate for international trade and investment and increased exploration and mining activities. The strategy to grow the mining sector relied upon a competitive fiscal and legal framework for mining investment, including the Mining Investment Law, which established incentives and tax benefits, such as a 30-year tax stability agreement that is granted at the time a feasibility study is submitted. The Mining Covenant defines policies relevant to Federal and Provincial authorities, and when passed in 1993, introduced modifications to the 1887 mining code. Even during Argentina's economic and political crisis that reached a climax at the end of 2001, the measures already in place provided a stable legal regime for the mining sector and, combined with what became a favorable domestic exchange rate in the wake of the crisis, resulted in increased investment in the mining sector (Bastida and others, 2005, p. 11–16.).

Production

Primary aluminum production increased by just 0.63% in 2010 compared with that of 2009 to about 413,000 metric tons (t) as Aluar Aluminio Argentino S.A.I.C. exceeded its recently expanded smelter capacity of 410,000 t. Gold mine output increased by about 36% in 2010 compared with that of 2009 to about 63,000 kilograms (kg) from 46,500 kg owing to production increases at Yamana Gold Corp. of Canada's Gualcamayo Mine, Pan American Silver Corp. of Canada's Mantial Espejo Mine, and Coeur d'Alene Mines Corp. of Idaho's Martha Mine. Silver mine output increased by 36% to about 723,000 kg in 2010 compared with a revised 533,000 kg in 2009 owing to increased production at Silver Standard Resources Inc. of Canada's Piriquitas silver and zinc operation and increased production at the Martha Mine. Production of boron increased by 23% to about 623,000 t compared with that of 2009. Iron and steel and ferroalloy production increased considerably compared with that of 2009. The increases brought production levels back to similar volumes of 2008 and may represent the rebalancing of global markets that drive supply and demand (table 1; Silver Standard Resources Inc., 2010, p. 8, 11; Yamana Gold, Inc., 2011, p. 19, 26).

Structure of the Mineral Industry

The mineral industry in Argentina was composed of domestic and foreign private and public companies. Argentina's Secretaría de Minería de la Nación [Mining Secretariat] was responsible for the administration, development, and promotion of mining and mining investment. The Dirección Nacional de Planificación Estrategica Regional [National Directorate of Regional Strategic Planning] and the Servicio Geológico Minero Argentino (SEGEMAR) [Geological and Mining Service of Argentina], the latter of which operated as a dependent decentralized agency, were under the authority of the Mining Secretariat. The Camara Argentina de Empresarios Mineros [Argentinian Chamber of Mining Companies] was a civil association dedicated to the development of a sustainable, prosperous mining industry. Table 2 is a list of the country's major mineral industry facilities (Ministerio de Planificacion Federal Inversion Publica y Servicios, 2011; Servicio Geologico Minero Argentino, 2011).

In 2009 (the most recent year for which data were available), the mining and quarrying and electric, gas, and water industries accounted for about 2% of the salaried employment in the private sector in Argentina. About 23,400 people were employed in the mining industry, of which about 15,000 worked in production. About 21,000 people were salaried, 1,200 were not salaried, and about 1,200 were contract or temporary employees. Construction and manufacturing each accounted for 7% of private sector employment (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 58; Instituto Nacional de Estadistica y Censos, 2011).

Mineral Trade

Argentina was a net exporter in 2010, and the value derived from all exported goods increased by 22.4% to $68.1 billion compared with $55.7 billion in 2009. Brazil (which received 21.1% of Argentina's exports) was the leading recipient, followed by China (8.5%), Chile, (6.6%), the United States (5.1%), the Netherlands, (3.5%), and Spain (3.3%). The combined value of goods exported to those countries accounted for about 51% of Argentina's total exports. Imported goods to Argentina were valued at $56.5 billion compared with $38.8 billion in 2009, which was an increase of about 45.7%. Brazil (which supplied 26% of Argentina's imports) was also the leading supplier followed by China (11%), the United States (9%), Germany (5%), Mexico (3%), and France (2%). The combined value of goods received by Argentina from those countries accounted for 56% of the country's total imports in 2010 (Instituto Nacional de Estadistica y Censos, 2011).

Of Argentina's $68.1 billion worth of exported goods in 2010, the autonomous city of Buenos Aires reported exports valued at $22.9 billion, of which,16%, or $3.6 billion, was accounted for by the combined value of iron and steel products, petroleum and gas, and petrochemicals. Santa Fe Province reported total exports of $14.8 billion, of which 2%, or $383 million, was accounted for by the combined value of iron and steel products, petroleum and gas, and petrochemicals. Chubut Province reported exports of $3.3 billion, of which 62%, or about $2 billion, was accounted for by petroleum and gas and the rest was accounted for by aluminum products. San Juan Province reported exports of $2.1 billion, of which 76%, or $1.6 billion, was accounted for by gold products and the rest was accounted for by iron and steel. Catamarca Province reported exports of $1.7 billion, of which 89%, or $1.5 billion, was accounted for by production of copper products and the rest was accounted for by the production of gold products. Other Provinces reported exported goods valued between about $25 million and $1.5 billion, which included some mineral products, including petroleum and gas, petrochemicals, and iron and steel products. For several of the other Provinces, no data were available (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 40; Instituto Nacional de Estadistica y Censos, 2011).

Commodity Review

Metals

Copper.—In 2010, about 25 million metric tons (Mt) of ore was mined at Minera Alumbrera Ltd.'s Alumbrera Mine

[Xstrata plc of Switzerland (50%) and Canadian companies Goldcorp, Inc. (37.5%) and Yamana Gold (12.5%)] from which about 546,800 t of concentrate containing about 140,000 t of copper was produced. Alumbrera is a copper and gold deposit that formed by the intrusion of a dacite porphyry into the Farallón Negro volcano-sedimentary rocks, resulting in large-scale hydrothermal alteration and mineralization of the porphyry itself and surrounding host rocks. The Farallón Negro district occurs within the Tucuman fault zone, which bounds the Puna plateau to the north and the basin and range province of the Sierras Pampeanas to the south. Alumbrera is one of several porphyry-related ore deposits in the Farallón Negro district. Hydrothermal alteration in the Alumbrera deposit is zoned from a central quartz-magnetite and potassic altered core, outward through intermediate argillic, phyllic, and propylitic assemblages. The deposit's ore minerals are chalcopyrite, native gold, molybdenite, and pyrite. The bulk of the copper and gold ore occurs in the potassic alteration zone; however, significant sulfide concentrations are observed in the intermediate argillic and phyllic alteration assemblages (Harris and others, 2008, p. 295; Xstrata plc, 2011a).

Production of copper in concentrate at Alumbrera decreased by 2% in 2010 compared with that of 2009 as a result of lower head grades and reduced recoveries that resulted from the processing of higher volumes of oxidized ore material. Pit wall instability along a known fault also decreased mining rates and minimized access to a high-grade area of the pit in the fourth quarter. The situation was expected to continue to affect production in 2011, but output was expected to recover in 2012. In February 2010, GoldCorp released an updated resource estimate as of December 31, 2009. The updated proven and probable reserve estimate, which remained the most recent resource estimate at the end of 2010, was 284 Mt grading 0.39% copper and 0.4 gram per metric ton (g/t) gold (GoldCorp Inc., 2010; Xstrata plc, 2011b, p. 74).

In 2010, Yamana Gold signed an agreement with its joint-venture partners at Minera Alumbrera granting the company the option to acquire interests, which had been held through various Yamana Gold subsidiaries, in the Agua Rica copper gold, molybdenum, and silver porphyry project in Catamarca Province. The option was expected to remain valid for up to 4 years. As of December 31, 2010, proven and probable reserves at Agua Rica included about 909 Mt grading 0.49% copper, 0.22 g/t gold, 0.031% molybdenum, and 3.4 g/t silver (Yamana Gold Inc., 2011).

In 2010, Xstrata Copper (a subsidiary of Xstrata plc) was in the advanced feasibility stage at its wholly owned El Pachon project. Xstrata Copper acquired El Pachon in 2006. In December 2010, the company reported a 30% increase of its mineral resources at El Pachon, which totaled about 1.8 billion metric tons of copper ore grading 0.51%. The El Pachon feasibility study was expected to be completed in 2012 (Xstrata plc, 2011b, p. 29–30).

Gold.—In 2010, about 6,500 kg of gold was produced from the Cerro Vanguardia Mine in Santa Cruz. AngloGold Ashanti Ltd. of South Africa held 92.5% ownership in the mine, and the company's attributable gold production was about 6,034 kg compared with 5,971 kg in 2009. The Government of Santa Cruz Province retained the remainder of the ownership through its mining company Formicruz S.E. The Cerro Vanguardia Mine consists of multiple small open pits on hydrothermal vein deposits in the Cerro Vanguardia district where gold and silver epithermal mineralization formed within the Deseado Massif. The average grade of the ore recovered in 2010 was reported to be 6.11 g/t compared with 6.51 g/t in 2009. AngloGold Ashanti reported that Cerro Vanguardia was one of its two lowest cost mines in 2010, with total cash costs of $11.76 per gram (reported as $366 per troy ounce) (Schalamuk and others, 1997; AngloGold Ashanti Ltd., 2010, p. 45, 54).

Silver.—In 2010, the Cerro Vanguardia Mine produced 87,809 kg of silver compared with 68,400 kg in 2009. AngloGold Ashanti's share of the recovered volume was about 81,000 kg and 62,000 kg, respectively. About 50,000 kg of silver was produced at Coeur d'Alene's Martha Mine, which was a 57.5% decrease compared with that of 2009. The decrease at Martha Mine was primarily owing to a 48.3% decrease in the number of tons milled as mining operations were reduced, although the reason for the reduction was not clear. Silver and gold mineralization at the Martha Mine is also hosted in epithermal quartz veins and veinlets within the generally sub-horizontal volcanic rocks of the Bahia Laura volcanic complex. The main ore minerals of gold and silver are argentite, electrum, native silver, and silver sulfosalt minerals (Schalamuk and others, 1997; Coeur d'Alene Mines Corp., 2011, p. 31).

Pan American Silver produced about 137,000 kg of silver and about 2,000 kg of gold from its Manantial Espejo silver and gold mine in Santa Cruz Province compared with 118,000 kg of silver and the same amount of gold in 2009, which was the operation's startup year. Estimated proven and probable reserves at the Manantial Espejo Mine as of December 31 included about 1.13 million kilograms of silver and about 16,600 kg of gold. The Manantial Espejo district is located in the west-southwestern part of the Deseado Massif. Mineralization is in quartz veins with native gold or electrum and scarce sulfides, as well as in quartz stockworks, sinter, and silicified bodies associated with hydrothermal breccias (Schalamuk and others, 1997; Pan American Silver Corp., 2011, p. 13, 21).

In 2010, Silver Standard Resources produced about 196,000 kg of silver at its Pirquitas silver and zinc project, which is located in Jujuy Province. As of December 23, reserve estimates at Pirquitas included proven tonnage of 10.7 Mt grading 194.5 g/t silver, probable reserves of 19.7 Mt grading 202.4 g/t silver, and combined measured and indicated resources of 14.8 Mt grading about 54 g/t silver. Pirquitas started up in the first quarter of 2009. By the third quarter of 2010, the crushers, mill, and processing plant were fully operational, and the company began processing sulfide ore. The Pirquitas epithermal vein deposit is hosted by the Ordovician Acoite Formation in the Puna belt of Jujuy Province. The Puna belt is a geologic terrane to the west of the Eastern Cordillera. The bulk of the Pirquitas property covers intensely folded Acoite Formation marine sedimentary host rocks of graywacke, shale, and siltstone. The fracture and breccia-hosted mineralization at Pirquitas consists of iron and zinc sulfides with accessory cassiterite and a variety of sulfides and sulfosalts. Silver occurs in the sulfosalt minerals freiburgite, miargyrite, polybasite, and pyrargyrite (Silver Standard Resources, Inc., 2010, p. 52, 54, 57; 2011, p. 3, 12).

Industrial Minerals

Lithium.—In 2010, FMC Corp. of the United States, which was the only company with a producing brine operation in Argentina, reported that it would increase production of lithium carbonate by 30% during the next year. In December, Lithium Americas Corp. of Canada announced that it had filed its updated NI 43–101-compliant resource estimate for its Cauchari-Olaroz lithium-potassium property located in Jujuy Province. The company's resource was increased by greater than 60% from the previous estimate, and the average lithium grade increased by up to 13%. The company reported that the estimate represented the third largest known lithium brine resource in the world behind the Uyuni deposit in Bolivia and the Atacama deposit in Chile. The Cauchari-Olaroz resource was estimated using accepted industry standard methods, and results were estimated with a block model developed using ordinary kriging techniques (Lithium Americas Corp., 2010).

Salars are generally the end product of a basin infill process that starts with the erosion of the surrounding relief, initially depositing colluvial talus and fan gravels, grading upward into sheet sands, and playa silts and clays as the basin fills. A recent study by Houston and others (2011) classified two types of salars in Argentina's Puna Plateau—mature halite salars and immature clastic salars. The authors characterized immature salars as those with higher precipitation and lower evaporation, which tend to be found at higher elevations, and that have an alternating sequence of fine-grained sediments and evaporitic beds of halite and or ulexite with brines that barely reach halite saturation. Mature salars were characterized as having less moisture flux and were more common in the lower and drier parts of the region. Mature salars were classified by a relatively uniform and thick sequence of halite with silty clay deposits and volcanic fallout creating thin layers of varying permeability that may have led to the formation of alternating aquifers and aquicludes. The contained brines are halite saturated throughout the brine body. Both types of salar may contain commercially valuable brine resources that reach very high concentrations (Houston and others, 2011).

Most exploration taking place in brine prospects had been carried out by junior mining companies with experience in metallic deposits that complied with existing Australian, Canadian, or European stock market commission standards for reporting mineral resources and reserves. Those standards, however, were designed for solid mineral phases, not fluids (such as brines) that flow and mix relatively rapidly through aquifers during the course of a project lifetime (Houston and others, 2011).

An in situ brine resource is defined by the volume of the host aquifer, the specific yield of the aquifer, and the concentration (or grade) of the elements of interest in the brine. The product of the geometry and specific yield determines the volume of the brine resource. The resource is determined as the product of the brine volume and the grade of the element in the brine. Defining the host aquifer boundaries and especially determining essential parameters of effective porosity, specific yield, and specific retention of the salars, though, is challenging, and results may be equivocal for numerous reasons, including varying permeabilities within the different types of salars and varying densities of fluids, which can affect flow rates; that different parts of the same salar may be classified as mature or immature; and so on (Houston and others, 2011).

Houston and others (2011) pointed out that drawdown starts as soon as pumping begins and continues throughout the life of a project (for example, drawdown contributes to fluid mixing and reorganization, which ultimately affects the fringe of a resource, the surrounding groundwater, or even a nearby defined project or operation that is working on the same or an adjacent salar). The authors concluded that there is no single resource or reserve value that can be determined and that current requirements for disclosure and reporting of fluid mineral prospects needed revision. While the authors' paper was in press, the Ontario Securities Commission issued Staff Notice 43–704, "Mineral Brine Projects and National Instrument 43–101 Standards of Disclosure for Mineral Projects," which provides guidance on reporting standards for brine prospects and addresses many of the issues raised in the paper by Houston and others (Houston and others, 2011; Ontario Securities Commission, 2012).

Outlook

In 2010, Argentina had about 15 operations that produced base and (or) precious metals, borates, lithium, and iron ore; at least 36 base- and precious-metals projects that were in the resource development or feasibility stages; and nearly 600 mining projects in total (metal and nonmetal). Since 2003, investment in the mineral industry had increased annually from $660 million to a cumulative value of about $11 billion. Exploration had also increased every year since 2003, and the mineral industry continued to expand in most aspects as it had every year since restructuring in the 1990s. Growth of the sector is likely to continue, especially if demand for mineral commodities from countries such as Brazil, China, India, and Russia continued to increase (Metals Economics Group, 2011).

Vale S.A. of Brazil's Rio Colorado potash project in Mendoza Province and Barrick Gold Corp. of Canada's Pascua Lama project in San Juan Province are huge projects that are expected to start up in the near term but that have encountered delays and (or) rising costs in development. Rio Colorado had received the most investment of any mining project in Argentina's history, and Pascua Lama, which crosses the border of Argentina and Chile, is one of the largest gold deposits in the world.

Vale expected to invest about $1.08 billion in the Rio Colorado project in 2012 and projected startup during the second half of 2014. The projected total investment in the project was $5.92 billion and the nominal output capacity was 4.3 million metric tons per year (Mt/yr) of potash compared with a 2007 projection by previous owner Rio Tinto plc of the United Kingdom of a total investment of $900 million and a production capacity of 2.4 Mt/yr. Development of the Rio Colorado project was delayed recently when the government of Mendoza Province suspended work for about 1 month, claiming that Vale had not complied with an agreement that the company contract 75% of the workforce, raw material purchases, and hiring of services from the Province (Metals Economics Group, 2011).

Barrick was reportedly on track for a 2013 startup at Pascua Lama, but the company expected preproduction costs to increase between 10% and 20% because of increased costs of labor and commodities, as well as a stronger Chilean peso and increased inflation in Argentina. In late 2010, the Argentine senate passed a law to prohibit mining exploration and operations in and around glaciers, which could directly affect development of Pascua Lama on Argentina's side of the border. Barrick, however, reportedly did not believe that the law would affect Pascua Lama's progress. Proven and probable reserves at Pascua Lama included about 385 Mt of ore grading 1.44 g/t gold, and measured and indicated resources were about 210 Mt grading 0.912 g/t for a total of almost 800,000 kg of contained gold (Metals Economics Group, 2011).

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TABLE 1
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010
METALS					
Aluminum, primary	272,942	286,386	393,900	410,200 [r]	412,800
Antimony, refined, secondary	2,208	2,726	2,500	2,200 [e, r]	2,200 [e]
Cadmium:					
Mine output, Cd content	122	111	124	131 [r]	124
Refined	6	35	38	36	32
Copper:					
Mine output, Cu content	180,144	180,223	156,893	143,084	140,001
Refined, secondary[e]	16,000	16,000	16,000	16,000	16,000
Gold, mine output, Au content kilograms	44,131	42,021	42,046	46,588	63,138
Iron and steel:					
Metal:					
Pig iron thousand metric tons	2,481	2,593	2,581	2,042	2,532
Sponge iron (direct reduction) do.	1,947	1,810	1,847	807	1,566
Total do.	4,428	4,403	4,428	2,849	4,098
Ferroalloys, electric furnace:[e]					
Ferrosilicomanganese	9,268 [r, 2]	8,917 [r, 2]	9,172 [r, 2]	6,644 [r, 2]	10,900
Ferrosilicon	24,400	15,000	10,400	11,300	11,000
Steel, crude thousand metric tons	5,533	5,387	5,543	4,014	5,138
Semimanufactures do.	5,308	5,173	5,210	3,749	5,046
Lead:					
Mine output, Pb content	12,064	17,045	20,788	24,753	22,554
Refined:					
Primary	12,064	11,568	13,482	12,558	14,245
Secondary[e]	37,000	49,000	59,000	70,000	63,000
Total[e]	49,100	60,600	72,500	82,600	77,200
Mercury	--	3,484	1,028	1,000 [e]	NA
Molybdenum	--	--	228	200 [e]	NA
Silver, mine output, Ag content kilograms	245,124	255,567	355,596	532,823 [r]	723,238
Zinc:					
Mine output, Zn content	29,808	27,025	30,349	31,869	32,566
Metal, smelter:					
Primary	42,584	42,876	39,479	32,989	39,540
Secondary	3,407	3,430	3,158	2,639	3,163
Total	45,991	46,306	42,637	35,628	42,703
INDUSTRIAL MINERALS					
Asbestos	299	282	298	322	341
Barite	6,276	37,979	3,170	3,416	2,944
Boron materials, crude	533,535	669,578	785,553	505,983 [r]	622,968
Cement, hydraulic thousand metric tons	8,929	9,602	9,703	9,385	10,000 [e]
Clays:					
Bentonite	246,165	250,260	256,182	148,099	204,209
Common	6,117,199	7,854,569	6,901,410	6,941,736	7,110,621
Kaolin	49,619	69,354	73,838	78,792	78,722
Diatomite	38,543	49,604	36,996	62,270	1,252,741
Feldspar	170,728	291,562	220,234	213,551 [r]	217,213
Fluorspar	8,278	9,735	15,098	13,424	17,657
Gypsum, crude	1,202,812	1,226,530	1,257,310	1,355,260 [r]	1,346,535
Lime[e]	NA [r]	NA [r]	NA [r]	NA [r]	NA
Lithium:[3]					
Carbonate	8,228	3,584	4,037	3,467	4,520
Chloride	8,416	3,107	2,746	1,549	2,405

See footnotes at end of table.

TABLE 1—Continued
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010
INDUSTRIAL MINERALS—Continued					
Mica	6,223	10,171	8,790	8,668	9,638
Nitrogen, N content of ammonia	NA [r]	NA [r]	NA [r]	NA [r]	NA
Peat, agricultural (turba)	15,119	13,665	12,119	7,752 [r]	6,345
Perlite	25,146	35,838	26,545	21,802	27,182
Phosphate rock:					
Gross weight	NA [r]	NA [r]	NA [r]	NA [r]	NA
P_2O_5 content	NA [r]	NA [r]	NA [r]	NA [r]	NA
Pozzolan	3,994	4,207	5,839	5,000 [e]	5,000 [e]
Pumice	17,665	16,200	6,500	7,020	7,582
Salt:					
Common	1,917,656	2,357,674	1,681,261	1,477,532	1,526,659
Rock	NA [r]	NA [r]	NA [r]	NA [r]	NA
Sand and gravel:					
Sand:					
Construction	21,143,480	29,122,031	28,532,557	27,183,525 [r]	31,296,935
Silica sand (glass sand)	446,240	456,666	472,612	364,157	531,161
Gravel	10,832,689	19,423,869	20,383,579	19,591,112	22,127,580
Stone:					
Basalt	542,475	841,503	1,101,578	2,116,582	1,652,032
Calcareous:					
Calcite, nonoptical	57,800	131,357	139,119	137,931 [r]	178,504
Dolomite, including crushed	392,681	680,895	1,047,874	1,252,643	1,524,713
Limestone	12,993,352	16,757,861	15,631,899	15,746,676	88,270,673
Crushed, unidentified	12,269,384	22,586,494	23,851,939	19,663,410 [r]	22,127,580
Marble, onyx, travertine	160,535	151,306	151,889	152,911 [r]	162,281
Flagstone	550,529	268,662	237,684	197,877	147,923
Granite, in blocks	71,395	100,697	73,888	79,111 [r]	153,792
Quartz, crushed	206,282	287,138	220,979	218,218 [r]	228,679
Quartzite, crushed	854,560	959,053	1,017,938	946,682	1,164,418
Rhyolite	NA [r]	NA [r]	NA [r]	NA [r]	NA
Rhodochrosite kilograms	78,832	50,593	136,371	122,117	122,839
Gemstones (agate, amethyst, and so forth) do.	54,505	12,745	89,675	119,650	45,054
Sandstone	22,452	15,000	--	--	--
Serpentine, crushed	1,725	184,480	150,470	142,000	192,000
Shell, marl	276,233	314,113	357,952	353,137	425,872
Tuff (toba) thousand metric tons	NA [r]	NA [r]	NA [r]	NA [r]	NA
Strontium minerals, celestite	19,822	4,909	14,910	8,169	8,512
Sulfates, natural:					
Magnesium (epsomite)	1,440	1,730	1,730	1,650 [r]	1,704
Sodium (mirabilite)	43,854	27,957	21,222	18,267	16,235
Talc and related materials	23,113	24,836	22,218	22,762 [r]	24,820
Vermiculite	1,585	1,726	1,813	2,150	2,500
Zeolites	NA [r]	NA [r]	NA [r]	NA [r]	NA
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen:					
Natural (asphaltite)	1,475	6,758	6,190	6,210	4,576
Byproduct of refinery	658,389	680,821	675,000	641,420	NA
Coal, bituminous thousand metric tons	295	220	208	181	140
Coke, all types, including breeze do.	1,191	1,200	1,474	1,413	1,400 [e]
Gas, natural:					
Gross million cubic meters	51,665	50,891	50,271	32,713	44,555
Marketed do.	NA [r]	NA	NA [r]	NA [r]	NA
Natural gas liquids thousand 42-gallon barrels	--	--	10,539	10,100 [r]	10,000 [e]

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	240,579	233,824	229,723	226,634 [r]	222,436
Refinery products:						
Liquefied petroleum gas	do.	11,464	11,027	11,000	9,168	10,000 [e]
Motor gasoline	do.	54,319	54,300	36,790	37,960	38,000 [e]
Aviation gasoline	do.	--	--	--	--	--
Jet fuel	do.	9,385	10,111	9,769	10,060	10,000 [e]
Kerosene	do.	178	167	63	87	90 [e]
Distillate fuel oil	do.	819	764	830	747	800 [e]
Residual fuel oil	do.	22,498	28,268	31,164	21,175	25,000 [e]
Lubricants	do.	2,435	2,150	2,000	2,456	2,500 [e]
Other	do.	34,823	137,059	154,949	188,993	189,000 [e]
Total	do.	135,921	243,846	246,565	270,646	275,390 [e]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. NA Not available -- Zero.

[1] Table includes data available through January 12, 2012.

[2] Reported figure.

[3] In recent years, information available from Argentine sources prompted major revisions in how lithium production is reported.

TABLE 2
ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[1]
Aluminum		Aluar Aluminio Argentino S.A.I.C. (private, 100%)	Abasto, Buenos Aires Province, and Puerto Madryn, Chubut Province	410.
Boron		Rio Tinto Minerals-Argentina (Rio Tinto Borax, 100%)	El Porvenir Mine and plant, Jujuy Province; Sije and Tincalayu Mines and plants, and Campo Quijano refinery, Salta Province	100.
Do.		Procesadora de Boratos Argentinos S.A. (Ferro Corp.)	Loma Blanca, Jujuy Province, and plant at Palpala, Jujuy Province	36.
Do.		Ulex S.A. (private, 100%)	Pastos Grandes, Salta Province	2.
Cement		Cementos Loma Negra C.I.A.S.A. (private, 100%)	Buenos Aires, Cordoba, Corrientes, Salta, Salta Juan, Mendoza, and Jujuy Provinces	6,000.
Do.		Cementos Avellaneda, S.A. (Corporación Uniland S.A. and C. Molins International S.A.)	La Caldera plant, San Luis Province, and Olavarria plant, Buenos Aires Province	2,800 cement, 220 lime.
Do.		Juan Minetti S.A. (Holcim Ltd., 100%)	Cordoba, Jujuy, and Mendoza Provinces	1,700.
Coal		Yacimientos Carbonifero Rio Turbio S.A. (private, 100%)	Rio Turbio, Santa Cruz Province	210.
Copper and gold[2]		Minera Alumbrera Ltd. (Xstrata plc, 50%; Goldcorp, Inc., 37.5%; Yamana Gold, Inc., 12.5%)	Alumbrera Mine, Catamarca Province	160 Cu, 13,000 Au.
Gold and silver	kilograms	Cerro Vanguardia S.A. [AngloGold Ashanti Ltd., 92.5%, and FOMICRUZ S.E. (Government of Santa Cruz Province, 7.5%)]	Cerro Vanguardia Mine, Santa Cruz Province	100,000 Ag, 10,000 Au.
Do.	do.	Coeur d'Alene Mines Corp., 100%	Martha Mine, Santa Cruz Province	120,000 Ag, Au NA.
Do.	do.	Minera Santa Cruz (Hochschild Mining plc, 51%, and Minera Andes Inc., 49%)	San Jose, Santa Cruz Province	15,000 Ag, 2,400 Au.
Do.	do.	Minera Argentina Gold (Barrick Gold Corp., 100%)	Veladero Mine, San Juan Province	21,000 Au, 125,000 Ag.
Do.	do.	Pan American Silver Corp., 100%	Manantial Espejo, Santa Cruz Province	1,900 Au, 125,000 Ag.
Do.	do.	Silver Standard Resources Inc., 100%	Piriquitas, Jujuy Province	215,000 Ag.
Do.	do.	Yacimientos Mineros de Agua de Dionisio (Government, 100%)	Farallon Negro, Hualfin, and Belen, Catamarca Province	4,600 Au, 50,000 Ag.
Do.	do.	Yamana Gold, Inc., 100%	Gualcamayo, San Juan Province	5,000 Au.
Iron and steel		Siderar S.A.I.C. (Ternium S.A., 60.93%)	San Nicolas, Buenos Aires Province	2,880 steel, 4,500 semimanufactures.
Do.		Acindar S.A. (AcelorMittal Group, 65%)	Plant Nos. 1 and 3, Buenos Aires Province; and Plant No. 2, near Rio Parana, Santa Fe Province	1,350 steel, 1,000 DRI.
Do.		Metallurgical Corp. of China Ltd.	Sierra Grande, Rio Negro Province	320 iron ore.
Do.		Siderca S.A.I.C. (Techint Group)	Buenos Aires Province	900 steel, 670 DRI.
Lead and silver, refinery[3]		AR Zinc Group (Glencore International AG, 100%)	Refineria Aguilar, Palpala Industrial Park, Jujuy Province	18,000 Ag. 15 Pb.
Lead, silver, and zinc[3]		do.	Aguilar Mine, Jujuy Province	49,800 Ag, 24 Pb.
Lithium	metric tons	Minera del Altiplano S.A. (FMC Corp.)	Salar del Hombre Muerto, Salta Province	7,260 chloride, 11,350 carbonate.
Natural gas	million cubic meters	Repsol YPF, S.A.	Neuquen, Rio Negro, Salta, Santa Cruz, and Tierra del Fuego Provinces	18,000.

See footnotes at end of table.

TABLE 2—Continued

ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[1]
Petroleum	million 42-gallon barrels	Repsol YPF, S.A.	Chubut, Formosa, Jujuy, La Pampa, Mendoza, Neuquen, Rio Negro, Salta, Santa Cruz, and Tierra del Fuego Provinces	366.
Do.	do.	Pan American Energy (Sucursal Argentina) LLC (BP p.l.c., 60%, and Bridas Corp., 40%)	Offshore Chubut and Santa Cruz Provinces	100.
Do.	do.	Chevron Argentina S.R.L.	El Trapial Field, Neuquen Province and other concessions	46.
Do.	do.	Petrobras Energia S.A. (Petroleo Brasileiro S.A., 100%)	La Pampa, Mendoza, Neuquen, Rio Negro, Salta, and Santa Cruz Provinces	15.
Do.		Petro Andina Resources Ltd. (Pluspetrol S.A., 100%)	Neuquen Basin	10.
Do.	do.	Tecpetrol S.A.	Golfo San Jorge Basin, Neuquen Basin, Northeast Basin	10.
Do.	do.	Total Austral S.A. (Total S.A., 100%)	Neuquen Province	NA.
Zinc		Glencore International AG, 100%	Aguilar Mine, Jujuy Province	44.
Do.		Coeur d'Alene Mines Corp., 100%	Martha Mine, Santa Cruz Province	NA.
Do.		Silver Standard Resources Inc., 100%	Piriquitas, Jujuy Proveince	NA.
Zinc, refinery		Aguilar AR Zinc Group (Glencore International AG, 100%)	Rosario, Santa Fe Province	44.

[e] Estimated. Do., do. Ditto. NA Not available.

[1] Abbreviations used in this table for commodities include the following: Ag—silver; Au—gold; Cu—copper; DRI—direct-reduced iron; and Pb—lead.

[2] Gold data are in kilograms.

[3] Silver data are in kilograms.

THE MINERAL INDUSTRY OF BOLIVIA

By Steven T. Anderson

Bolivia's primary role in the global mineral industry was as a supplier of minerals in raw form (ores and concentrates). The country was estimated to have produced about 8% of the world's total mine output of tin in 2010; that of silver, about 6%; antimony, about 4%; boron and zinc, about 3% each; lead and tungsten, about 2% each; and bismuth, about 1%. Bolivia was the leading exporter (by way of pipelines to Argentina and Brazil) and one of two third-ranked producers (tied with Brazil) of natural gas in South America. Bolivia's mineral resources have not been fully explored or developed, so there are substantial uncertainties concerning the country's mineral resources. In addition to the minerals listed above, Bolivia is believed to have globally relevant resources of cadmium, chromium, gold, indium, iron ore, lithium, nickel, palladium, platinum, potash, and tantalum. In 2010, more than 70% of Bolivia's mine output of tin, as well as substantial proportions of the country's mined copper, gold, and silver; some antimony; and small amounts of a few other mined minerals were estimated to have been smelted or refined within the country. Most of the volume of Bolivia's mineral production, however, was exported in raw form by rail to ports on the coasts of Argentina, Brazil, Chile, and (or) Peru and then shipped to processing facilities located in Asia, Europe, and North America, including approximately all the country's mine output of bismuth, tantalum, tungsten, and zinc (including any contained indium and other byproduct minerals). In addition, about 80% of Bolivia's marketable production of natural gas appears to have been exported (table 1; Arce-Burgoa and Goldfarb, 2009; Angulo, 2011; BP p.l.c., 2011b, p. 22, 28; Brooks, 2011; Carlin, 2011a–c; Guberman, 2011; Ministerio de Minería y Metalurgia, Bolivia, 2011a, p. 11, 17, 19–20, 34–37; Shedd, 2011; Tolcin, 2011).

Minerals in the National Economy

According to preliminary estimates for 2010 and revised estimates for 2009, the value of output of the mineral extraction sector (mining and quarrying plus production of crude petroleum and natural gas) of Bolivia accounted for 14% ($2.78 billion[1]) of the country's gross domestic product (GDP) in 2010 compared with 13% ($2.26 billion) in 2009. The mining and quarrying sector accounted for 8.86% (about $1.76 billion) of the GDP, and the oil and gas sector accounted for 5.16% ($1.02 billion) in 2010 compared with 7.94% (about $1.39 billion) and 5.02% ($0.88 billion), respectively, in 2009. In 2010, mined zinc led all the nonfuel minerals in Bolivia in terms of both the tonnage and the value of production. Preliminary data indicated that the value of the country's production of mined zinc was $887 million followed by that of silver ($815 million), tin ($414 million), gold ($252 million), and lead ($156 million). Ulexite (a boron mineral) led all the industrial minerals in Bolivia (not including manufactured products, such as cement) in terms of both the tonnage and the value of production. In terms of the value of production, the country's top three industrial minerals were ulexite (valued at about $16 million), boric acid ($6.5 million), and amethyst ($1.1 million) (International Monetary Fund, 2011; Ministerio de Minería y Metalurgia, Bolivia, 2011a, p. 1; Instituto Nacional de Estadística, Bolivia, undated a).

The hydrocarbons sector was the leading source of tax revenue for the Government. In constant 1990 prices, the real value of Bolivia's production of crude petroleum and natural gas increased by 14% in 2010 compared with that of 2009 after decreasing by 13.5% in 2009 compared with that of 2008. Of the sectors that contributed to the estimated 4% growth in the real GDP in 2010, the oil and gas sector ranked second only to the transportation and storage (warehousing) sector. On the other hand, the real value of the country's total production of metallic and industrial minerals decreased by 4% in 2010 after increasing by 10% in 2009 (Amcham Bolivia, undated; Instituto Nacional de Estadística, Bolivia, undated a).

In 2009 (the latest year for which data were available), the total labor force employed in mining was estimated to be about 65,100. Of these workers, an estimated 51,900 were officially registered with a cooperative, 5,550 were estimated to be employed by medium-scale mining companies (private or joint ventures with state-owned Corporación Minera de Bolivia [COMIBOL]), and at least 2,450 small-scale and artisanal miners were estimated to be working (Ministerio de Minería y Metalurgia, Bolivia, 2010e, p. 59).

Preliminary data from the Banco Central de Bolivia (BCB) indicate that the flow of foreign direct investment (FDI) into the exploration for and production of crude petroleum and natural gas decreased to $310 million in 2010 compared with about $325 million in 2009, and the flow of FDI into the mining and quarrying sector increased to $220 million compared with about $92 million in 2009. In 2010, the inflow of FDI into the oil and gas sector accounted for about 34% of the total flow of FDI into Bolivia, and the inflow of FDI into the mining and quarrying sector accounted for about 24%. In 2010, the leading sources of FDI into the Bolivian economy were (in order of decreasing inflows of FDI) Spain, Sweden, and France compared with the United States, Spain, and Brazil, respectively, in 2009 (Banco Central de Bolivia, 2011b, p. 26–28).

For Bolivia, the value of trade in minerals may include the value of some transportation and (or) pipeline services. A possible estimate of the mineral trade balance (not including imports of many chemical and pharmaceutical substances, construction materials, or primary materials for agriculture that may have been heavily or exclusively mineral based) increased to $4.24 billion in 2010 compared with a revised balance of about $3.04 billion in 2009. The leading mineral export of Bolivia (by value) was natural gas, and the value of natural gas exports increased to $2.8 billion compared with about $2 billion in 2009. The country's leading mineral import expenditures were for fuel oils and lubricants, and the cost of its imports in this category increased to $615 million compared with $470 million in 2009. Zinc in concentrates remained the leading nonfuel mineral export in 2010, and the value of exports of zinc increased to $887 million compared with $690 million in 2009. Production and exports of silver were of increasing economic importance, and the value of the country's exports of silver (mostly contained in concentrates) was reported to be $797 million compared with about $610 million in 2009. The leading nonfuel mineral import category (by far) was "imports of mineral raw materials and products for industrial use," and the cost of these imports increased to $504 million compared with about $410 million in 2009 (Banco Central de Bolivia, 2011b, p. 8–10; 41–42, 68; Ministerio de Minería y Metalurgia, Bolivia, 2011a, p. 12, 17).

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[1] Where necessary, nominal values have been converted from Bolivian bolivianos (Bs) to U.S. dollars (US$) at an annual average exchange rate of Bs6.97=US$1.00 for 2009 and an estimated Bs6.96=US$1.00 for 2010. All values are nominal, at current prices, unless otherwise stated.

Government Policies and Programs

On January 25, 2009, Bolivians approved a new Constitution, which was enacted on February 7. The new Constitution contains provisions that could allow the Government to exercise greater control over the management of Bolivia's natural resources, including exploration, production, processing, transportation, and marketing of minerals, but how the principles of the Constitution are implemented and the timing of implementation appear to depend upon the drafting and passing of subsequent regulations by the Government. During all of 2010, the Government continued to work out a first draft of a new mining law to replace the Mining Code of 1997 (law No. 1777 of March 17, 1997), and the draft was completed in January 2011. The new draft mining law was expected to continue to be debated and revised throughout 2011 (Ministerio de Minería y Metalurgia, Bolivia, 2010a; 2010e, p. 25, 37–39, 64–65, 67, 75–78, 93, 114–116, 124; 2011b, p. 7; 2011c, p. 18, 122, 139–143).

In mid-2010, it appeared likely that mining companies operating mineral concessions in the country would have to change over to a new mining contract system by the end of the year, in accordance with the principles of the new Constitution and the expected provisions of the new mining law (despite the new mining law still being preliminary). These new contracts could be either leasing or joint-venture contracts with the Government, depending on the level of state participation. Some companies (such as Coeur d'Alene Mines Corp. of Idaho) already appeared to have similar types of contracts with the Government, regional governments, and (or) local cooperatives. The Government had still not determined which Federal agency or other institution would oversee the contracts. With the issuing of Supreme Decree No. 0726 on December 6, 2010, the Government reaffirmed that there would be a transition period (of indeterminate length) to move from the existing mining concessions structure towards public-private contracts that would be consistent with the Constitution and the draft mining law. The negotiation of such contracts between at least a few of the most significant mining companies in Bolivia (including Glencore International AG of Switzerland) and the Government appeared to be ongoing through the end of the year (Beltrán, 2010c; Ministerio de Minería y Metalurgia, Bolivia, 2010a, b; Coeur d'Alene Mines Corp., 2011, p. 6, 18; Glencore International AG, 2011, p. 72).

Effective on May 2, 2010, the Government announced that it had nationalized the Vinto antimony plant (operated by Compañia Minera Colquiri S.A., which was a subsidiary of Glencore), and that the plant would be operated by state-owned Empresa Metalúrgica Vinto (EMV). At the time of nationalization, the antimony plant apparently was not operating. The Government planned to rehabilitate and reactivate the plant, but information concerning a definitive timeline for restarting production there was not available. Reportedly, law No. 32 of August 6, 2010, allocated necessary land for Jindal Steel & Power Ltd. (Jindal) of India to construct a direct-reduced iron plant, an iron ore pelletization plant, and a steel plant near the one-half of the El Mutun iron ore deposit that was being developed by the company (Jindal Steel & Power Ltd., 2010; Kosich, 2010a, b; Ministerio de Minería y Metalurgia, Bolivia, 2010c, d; Ore, 2010).

During all of 2010, the main mining law was still the Mining Code of 1997. In 2007, this mining code was modified to allow for restructured royalties (mining-specific taxes) and other taxes to be charged to mining companies. The 2007 law (law No. 3787 of November 24, 2007) included measures that (1) require companies to pay an additional income tax of 12.5% if the prices of the minerals produced exceed certain thresholds (specific to each mineral), and (2) restructure both the royalty rates and the percentages of redistributions (to local, State, or Federal entities) of Government royalty and tax revenue from private mining companies in the country. In 2010, the Government's combined revenues from mining royalties and other taxes on mining companies were estimated to have increased to about $290 million compared with about $105 million in 2009 and about $150 million in 2008. The increase in Government revenue from the mining sector in 2010 was mostly owing to an increase in royalties to about $120 million compared with about $83 million in 2009. During 2010, it appeared that the main law governing private investment (including FDI) was still law No. 1182 of September 17, 1990, even though some provisions of this investment law may conflict with related provisions in the new Constitution. The main environmental law was still law No. 1333 of March 27, 1992 (Ministerio de Minería y Metalurgia, Bolivia, 2007; 2010e, p. 57, 95; 2011a, p. 52, 58; 2011b, p. 39; 2011c, p. 135; U.S. Commercial Service, 2010, p. 3, 8, 15, 28–35).

During 2010, the Hydrocarbons Law of 2005 (law No. 3058 of May 17, 2005) was still in effect. On May 2, 2007, operations contracts came into effect for private oil and gas companies in accordance with the terms of the Government's program to nationalize the sector. These operations contracts were approved as part of the Hydrocarbons Law of 2005, which also allowed for two other new types of contracts between private companies and the state—production-sharing contracts and association contracts. Under all three types of contracts, oil and gas reserves and any production belongs to the state, and the contractor (private company) must deliver the full amount of production to the state-owned oil and gas company, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB). These contracts were designed to replace risk-sharing contracts, which existed under the previous Hydrocarbons Law of 1996 (law No. 2689 of April 30, 1996). In effect, the contractors bore all of the risks and costs for the exploration and production of hydrocarbons under the risk-sharing contracts but were allowed to claim ownership of production and sell it on the open market, subject only to paying royalties and taxes. On May 1, 2006, the President issued Supreme Decree No. 28701 to nationalize the hydrocarbon resources of Bolivia. Following this decree, the Government negotiated operations contracts with existing private producers of oil and natural gas in the country, and the contracts were approved by the Government on April 23, 2007. These contracts still require the private contractors to bear the risks and costs of production. In addition, however, the private companies cannot claim ownership of oil and gas reserves in the country and must rely on reimbursement by the Government to cover any recoverable costs and (or) be compensated for any profits they might earn (Vargas, 2007; U.S. Commercial Service, 2010, p. 3, 13–14, 29–35).

Production

Data on mineral production are in table 1. In 2009, production of most mineral fuels, most industrial minerals, and some metallic minerals (such as antimony, gold, and tungsten) decreased significantly compared with production in 2008. In 2010, production of mined lead, silver, and zinc decreased after actually increasing in 2009, possibly owing to protests that could have affected production at the San Bartolome Mine, the San Cristobal Mine, and other mines in the Potosi region. Production of mined antimony and tungsten increased by 67% and 18%, respectively, in response to an increase in global demand and prices for these metals. Bolivia's production of gold continued to decrease, however, mostly owing to decreased production at the Don Mario Mine, where gold production was in transition from the depleted lower-mineralized zone to the upper-mineralized zone during all of 2010. Bolivia's mine output of tin continued to increase (by 3%), and the increase was mostly owing to increased production by small-scale and cooperative mining operations in the country; the increase in tin production was slight compared with the 13% increase in 2009, which was primarily owing to increased production at the state-owned parts of the Huanuni Mine (table 1; Asociación Nacional de Mineros Medianos, 2010, p. 96–97; Ministerio de Minería y Metalurgia, Bolivia, 2010e, p. 52, 85–90; 2011a, p. 1; 2011b, p. 10, 27–33; 2011c, p. 39; Orvana Minerals Corp., 2010, p. 8; Quiroga, 2010; Sumitomo Corp., 2010b).

In 2010, none of the indium that was estimated to have been contained in some of the metallic ores and concentrates (possibly including those of silver, tin, or zinc) produced in Bolivia was reported to have been recovered domestically, so any indium content was instead recovered in the countries that imported these indium-bearing metallic mineral raw materials from Bolivia. Estimates of the volume of indium contained in the mine output of Bolivia are included in table 1 as a result of new information on the indium content of mine output produced in the country (particularly of zinc concentrates). In 2010, mine output of indium in Bolivia was estimated to have increased by about 18% mostly owing to an increase in production of zinc in concentrates at the San Vicente Mine, although the owner of the mine (Pan American Silver Corp. of Canada) did not report any indium byproduct credits for exports of these concentrates. Reliable information was not available regarding the destination(s) for refining of any concentrates produced at the San Vicente Mine, or whether any indium was recovered during further processing of these concentrates (Ishihara, Murakami, and Marquez-Zavalia, 2011; Pan American Silver Corp., 2011, p. 36).

Production of antimony metal (including antimony trioxide) reportedly decreased by 82%. Based on export data, reported production for 2010 appears not to include production of antimony trioxide (if any), whereas that for 2009 and earlier years does. Production of silver metal was estimated to have increased by about 580%. More reliable information concerning either the estimated production in 2009 (based on export data) or the reason for such a dramatic increase was not available, but it could be that silver mined at the San Bartolomé Mine and further processed within Bolivia to produce silver metal or refined silver was accurately reported for the first time in 2010. Information concerning the causes of some of the other large year-to-year percentage changes in many of the data series for metals in table 1 was not available. Many of these changes are large in percentage terms but do not involve globally or even regionally significant volumes of production because of the still small level of production of these (minor) metals in the country (table 1; Asociación Nacional de Mineros Medianos, 2010, p. 98; Ministerio de Minería y Metalurgia, Bolivia, 2010b, p. 47–48, 87–88; 2010c, d; 2011a, p. 11, 20; Coeur d'Alene Mines Corp., 2011, p. 22–23).

Since about 2003 and through 2010, Bolivia's construction sector increased its annual sales, and domestic demand for minerals and mineral materials used in construction presumably also increased. The country's production of cement increased accordingly, but production of gypsum increased dramatically in 2007 only to decrease almost as dramatically in 2009 and to below even the 2006 level in 2010. These relatively abrupt changes in gypsum output could be because cement is a manufactured product that can be produced with imported clinker and other imported raw materials, whereas Bolivia's production of mined gypsum is constrained by the available gypsum mine capacity within the country. Boron was the only industrial mineral for which Bolivia accounted for greater than 1% of the world's production, and production of ulexite (a mined boron mineral) and boric acid each increased by about 14% compared with their volumes of production in 2009. Most of (and possibly all) the ulexite was produced in the salars of the country, including the Salar de Uyuni, but further information concerning the production of ulexite or other boron materials (or rock salt, or any other mineral that might be produced from the salars) in Bolivia was not available (table 1; Asociación Nacional de Mineros Medianos, 2010, p. 82–83, 94–97;

Ministerio de Minería y Metalurgia, Bolivia, 2010e, p. 38–39, 80–83, 122; 2011a, p. 1; 2011c, p. 22–24; Amcham Bolivia, undated; Instituto Boliviano del Cemento y el Hormigón, undated).

Production of the gemstone ametrine reportedly increased by greater than 6,000%, but this is from a historically small amount of production reported in 2009. It appears that the reported figures for the production of gemstones are based on export control data, and the data for any given year could reflect production that actually took place the previous year but was not reported by the export-control authorities until the current year, or could include production that actually took place 2 or more years before the current year if the gemstones were exported (illegally) and this was not discovered or accounted for until the current year. More reliable information concerning Bolivia's gemstone production was unavailable (table 1; Asociación Nacional de Mineros Medianos, 2010, p. 94–97; Ministerio de Minería y Metalurgia, Bolivia, 2011a, p. 1).

Marketable production of natural gas is estimated to have increased by about 17% compared with that of 2009, and this increase appeared to be owing primarily to a supply response to increased demand for imports of natural gas by Brazil. Preliminary figures indicate that the total volume of Bolivia's natural gas exports to Brazil increased by 21.1% compared with that of 2009, and those to Argentina increased by 7.65%. Production of crude petroleum did not increase by nearly the same percentage as production of natural gas, but the 19% increase in the production of natural gas liquids helped make up for the only slight (about 2.3%) increase in crude oil production (BP p.l.c., 2010b, p. 30; 2011b, p. 22, 28; U.S. Energy Information Administration, 2011; Instituto Nacional de Estadística, Bolivia, undated b).

Structure of the Mineral Industry

Table 2 is a listing of the major mineral industry facilities, together with the major owners and (or) operators. The vast majority of the mining workforce in Bolivia consists of miners working for small-scale mining operations or cooperatives, and these small-scale operations often manage to combine to produce more of many minerals than the few medium-scale mines. In 2010, small-scale and cooperative miners accounted for 100% of mined bismuth, industrial minerals, and tungsten production and about 68% of antimony, 62% of gold, about 42% of tin, about 30% of copper, 27% of silver, about 23% of zinc, and about 14% of lead; medium-scale mining operations accounted for the remainder of mined metal production in Bolivia, except for copper and tin. State-owned mining companies accounted for 48% of mined tin production and about 43% of mined copper production (Ministerio de Minería y Metalurgia, Bolivia, 2011a, p. 1).

With respect to medium-scale mining in the country in 2010, Empresa Minera San Cristóbal S.A. was the leading privately owned mining company (in terms of the value and volume of mined minerals produced), and it was the leading producer of mined lead, silver, and zinc in Bolivia. The company's production was from the San Cristobal Mine, which the company's owner (Sumitomo Corp. of Japan) claimed was the third ranked producer of mined silver and the sixth ranked producer of mined zinc in the world in 2009. The second ranked producer of mined zinc in Bolivia was Sinchi Wayra (a subsidiary of Glencore), and the second ranked producer of mined silver was Empresa Minera Manquiri S.A. (a 100% subsidiary of Coeur d'Alene Mines) (table 2; Sumitomo Corp., 2009; 2010a, p. 3, 39; Asociación Nacional de Mineros Medianos, 2010, p. 72–75; Ministerio de Minería y Metalurgia, Bolivia, 2010e, p. 46–51; Coeur d'Alene Mines Corp., 2011, p. 2, 22; Glencore International AG, undated).

On March 26, 2008, the Government issued Supreme Decree No. 29486, which set a deadline of April 30, 2008, for the transfer of ownership shares in various oil and gas companies operating in Bolivia to YPFB, such that YPFB would own at least 50% plus one of the voting shares in these companies (as stipulated in Supreme Decree No. 28701 of May 1, 2006). On January 23, 2009, the Government issued Supreme Decree No. 29888 to nationalize all shares of Pan American Energy (PAE) (60% owned by BP p.l.c. of the United Kingdom and 40% owned by BRIDAS Corp. of Argentina) in Empresa Petrolera Chaco S.A., to change the name of Empresa Petrolera Chaco S.A. to YPFB Chaco S.A., and to have this new subsidiary of state-owned YPFB assume full control of all operations. On April 12, 2010, PAE registered arbitration proceedings against the Government with the International Centre for Settlement of Investment Disputes, to try and obtain what PAE considered to be adequate compensation for the nationalization of Empresa Petrolera Chaco. Information concerning the final resolution of this arbitration was not available. In BP's 2010 annual report, the company mentions that the nationalization of Chaco took place in 2009 (with compensation payable), so table 2 has been updated to reflect Chaco's new company name and ownership structure (BP p.l.c., 2010a, p. 23–24, 26; 2011a, p. 44, 52–54, 163, 221; Diaz, 2010; Ore and García, 2010).

Mineral Trade

In 2010, Bolivia exported about 9.82 billion cubic meters of natural gas to Brazil and 1.83 billion cubic meters of natural gas to Argentina compared with about 8.11 billion cubic meters and 1.7 billion cubic meters, respectively, in 2009. In decreasing order of export value in 2010, the country's top six nonfuel mineral exports were zinc in concentrates, silver (in concentrates and metal), tin (in concentrates and metal), lead in concentrates, gold (in concentrates and dore), and antimony (in antimony trioxide, concentrates, and metal); by far the leading industrial mineral exports were ulexite and boric acid, respectively (in terms of export value). In tonnage, exports of tin increased to about 17,900 metric tons (t) compared with 17,609 t in 2009; ulexite, to about 97,303 t compared with 85,530 t in 2009; boric acid, to 12,619 t compared with 11,114 t in 2009; and antimony, to about 4,980 t compared with about 2,990 t in 2009. Exports of zinc decreased to 410,322 t compared with about 428,959 t in 2009; lead, to 73,291 t compared with a revised quantity of 84,880 t in 2009; silver, to 1,272 t compared with 1,324 t in 2009; and gold, to about 2,400 kilograms (kg) compared with about 3,700 kg in 2009 (BP p.l.c., 2010b, p. 30; 2011b, p. 28;

Banco Central de Bolivia, 2011a, p. 32–34; Ministerio de Minería y Metalurgia, Bolivia, 2011a, p. 12, 17, 19).

In decreasing order of export value in 2010, the leading country destinations for Bolivia's combined nonfuel mineral exports were Japan, Belgium, and the Republic of Korea. Country-specific information on Bolivia's nonfuel mineral exports by commodity was not available, but the country exported about 235,000 t of zinc in concentrates (including any indium that could have also been contained in those concentrates) to Asia, 136,000 t to Europe, and about 38,800 t to other countries in the Americas. The leading regional destinations for Bolivia's exports of silver were the Americas (472 t), Asia (about 466 t), and Europe (about 273 t); the leading regional destinations for exports of tin were the Americas (about 10,500 t), Asia (about 5,250 t), and Europe (2,170 t) (Banco Central de Bolivia, 2011a, p. 36, 40; Ministerio de Minería y Metalurgia, Bolivia, 2011a, p. 31–36).

Commodity Review

Metals

Antimony.—EMV planned to work on rehabilitating the Vinto antimony plant during the second half of 2010, and the state-owned metallurgical company also planned to encourage exploration efforts to increase antimony reserves and feed for the plant. In December, EMV appeared to be in the process of securing the equipment necessary to upgrade and restart the Vinto antimony plant. The initial design capacity of the antimony smelter at Vinto was reportedly 6,000 metric tons per year (t/yr), but it does not appear to have produced more than 100 t/yr of antimony metal (regulus), if any, during recent years. The Government's plan was for the Vinto antimony plant to be able to produce about 3,600 t/yr of antimony metal, depending on the availability of feed. In 2010, the annual average price of antimony was estimated to have increased by about 57% compared with that of 2009 owing to antimony mine and plant closures in China (which could continue into 2011). In 2010, Bolivia increased mine output of antimony by about 67%, and EMV hoped to restart the Vinto antimony plant sometime in 2011 (tables 1, 2; Beltrán 2010a, d; Waldmeir, 2010; Carlin, 2011a; Metal Bulletin, 2011; Ministerio de Minería y Metalurgia, Bolivia, 2010c; 2011a, p. 7, 49–51; 2011b, p. 17, 28, 34, 38; 2011c, p. 55–57).

Indium.—Although the San Cristobal Mine was the leading producer of zinc in the country in 2010, Ishihara and others (2011) estimated that a sample taken from the ore deposit underlying the mine contained only about 11 parts per million (ppm) indium. Thus, it was assumed for the purposes of estimating possible run-of-mine production of indium for this report that any indium content associated with the production of zinc in concentrates at the San Cristobal Mine was negligible, and run-of-mine production of indium at the San Cristobal Mine was estimated to be zero. For the mines that were considered as possible producers of indium in table 2, examples of the estimated indium content of selected samples taken by Ishihara and others (2011) from the deposits underlying these mines include 2,730 ppm indium in a sample of ore from the Bolivar deposit, 1,290 ppm indium in a sample of ore from the San Vicente deposit, and 821 ppm indium in a sample of ore from the Porco deposit. Estimates by Ishihara and others (2011) of the quantity of indium (in proportion to the quantity of zinc) in samples of ores and concentrates from some of the deposits that appeared to have a higher indium content form the basis for the estimates of the country's possible run-of-mine production of indium in table 1 (tables 1, 2).

Although only three medium-scale mining companies were included as producers of indium in table 2, Ishihara and others (2011) estimated that various levels of indium are present in many of the tin-polymetallic base-metal deposits in the Eastern Cordillera of Bolivia. Consequently, other mining operations that produced minerals from these deposits could theoretically have produced at least some (undetermined amount of) indium as part of their mine output. Sometime in 2011, South American Silver Corp. of Canada expected to restart prefeasibility studies at the company's Malku Khota silver-indium project in Bolivia (table 2; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 43; South American Silver Corp., 2011).

In 2008 (the latest year for which data were available), by far the leading destinations for Bolivia's exports of zinc in concentrates were the Republic of Korea (419,000 t), Japan (166,000 t) and Belgium (about 140,000 t), and these countries were estimated to have ranked second, third, and fifth, respectively, in global refinery production of indium. Depending on the source deposit (in Bolivia) for the exports of zinc in concentrates to these three countries, they could have been among the leading refinery producers of indium byproduct output from Bolivian mines in 2010. The fourth ranked destination for Bolivian exports of zinc in concentrates (in 2008) and the estimated fourth ranked producer of refined indium in the world in 2010 was Canada, so Canada could also have been a significant location for recovery of indium from Bolivian mine output (López and Ferrufino, 2009, p. 68; Tolcin, 2011).

Near the end of 2010, the Bolivian Government planned to award contracts for the construction of two new zinc smelters to increase the future value of zinc exports. Increasing zinc processing capacity domestically could also increase Bolivia's capacity to recover indium (and other byproducts, such as cadmium) from zinc concentrates if circuits for the recovery of these metals are part of a refinery that could be included in the design of new zinc smelting (and refining) facilities. Inclusion of a zinc refining circuit was supposed to be part of the project to refurbish, modernize, and activate the Karachipampa lead-silver smelter (which had been inactive since its initial construction in 1985). This project was still ongoing through the end of 2010, however, and information regarding whether the proposed zinc refinery would include a circuit to recover indium was not available. In 1993, EMV planned to start a project to build a plant at the Vinto smelting and refining complex to chemically treat tin metal and recover high-purity indium metal from the resulting solution by electrolysis, but information about whether that project or any other project to recover indium at Vinto was ever completed was unavailable (table 2; Empresa Metalúrgica Vinto, 1993; Beltrán, 2010b; Ministerio de Minería y Metalurgia, Bolivia, 2010e, p. 48, 123; 2011b, p. 12, 26, 34; 2011c, p. 59–63; Ishihara and others, 2011).

Iron Ore.—Jindal reported that the company had mined some iron ore at the El Mutun Mine during 2010 but did not specify the exact quantity or the metal content of any ore produced. The Ministerio de Minería y Metalurgia, Bolivia (MMM) reported that there was 18 t of iron production by small-scale and cooperative miners, but information about whether this production of iron was at El Mutun, represented the gross weight of the ore, or reflected the Fe content of production was not available. Jindal reported that it expected to begin shipments of iron ore produced at El Mutun by sometime around mid-2011. The company planned to export initial production of iron ore mainly to China, the Middle East, Europe, and other countries in South America by way of the Parana Paraguay Hidrovia riverway. In 2010, Jindal reported that it had begun construction of a plant to produce 10 million metric tons per year (Mt/yr) of iron ore pellets, a plant to produce 6 Mt/yr of sponge iron, and a plant to produce 1.7 Mt/yr of crude steel; these new plants were projected to become operational by 2014 or 2015. Jindal also reported plans to construct a natural gas-based direct-reduced iron (DRI) plant with a capacity to produce 2.52 Mt/yr of DRI, but it was unclear whether the DRI plant was expected to be part of the planned sponge iron plant or not (Jindal Steel & Power Ltd., 2010; 2011, p. 9, 15, 38, 75; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 1; 2011c, p. 31–34).

Lead, Silver, and Zinc.—Sumitomo reported that the protests that affected production of lead, silver, and zinc at the San Cristobal Mine were aimed at changing the redistribution of revenue from mining royalties by the Government of Bolivia and the Potosi regional government and demanding that improvements to the infrastructure in the area be made; the protesters also targeted Empresa Minera San Cristóbal S.A. (a 100% subsidiary of Sumitomo) concerning the way the company used water for the San Cristobal Mine (Sumitomo Corp., 2010b).

Coeur d'Alene Mines reported that the San Bartolomé Mine (which is located on the flanks of the Cerro Rico Mountain) produced about 210,000 kg of silver in 2010 compared with about 230,000 kg of silver in 2009, but that on October 14, 2009, the Government had suspended mining activities on Cerro Rico above the elevation of 4,400 meters (m) above sea level, which placed a significant constraint on Coeur d'Alene Mine's mining plan for the San Bartolomé Mine. In March 2010, Empresa Minera Manquiri began mining operations in the Huacajchi deposit above the 4,400-m level on Cerro Rico under an agreement with the Cooperativa Reserva Fiscal (a local mining cooperative). Although the Government restriction on mining above the 4,400-m level continued through the end of 2010 (at least), the Huacajchi deposit was reportedly confirmed by the Government to be excluded from this restriction (Coeur d'Alene Mines Corp., 2011, p. 2, 22–25).

Tin.—In 2010, production of tin at the Huanuni tin mine decreased to 9,751 t compared with 9,968 t in 2009, but this was still substantially higher than the 7,875 t of tin production at the Huanuni Mine in 2008. The substantial increase in 2009 appeared to be partly owing to smaller scale Government investments to increase the capacity of an existing mill (apparently one of at least two older mills at the mine) to achieve a throughput of about 1,200 metric tons per day (t/d) of ore compared with an average rate of about 1,000 t/d in 2008, and to the use of about 300 t/d of throughput capacity at another mill nearby that had previously been used by separate small-scale tin mining cooperatives. In 2010, the slight decrease in tin production could have been owing to slowdowns or temporary stoppages of existing mills (either at Huanuni or nearby), or it could have been owing to a strike by Huanuni miners over a compensation dispute with the state-owned tin mining company Empresa Mineral Huanuni (EMH) at the beginning of the year. EMH planned to expand the throughput capacity at the Huanuni Mine by about 3,000 t/d of ore by constructing a new mill, and completion of this new mill combined with expansion of output of ore at the mine could increase tin production capacity at the Huanuni Mine to 14,000 t/yr from an estimated 10,000 t/yr during 2010. This project was delayed through all of 2010, however, while the Government issued two unsuccessful calls for tendering this investment (ITRI Ltd., 2010a, b; 2011a, b; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 7–10, 16, 23, 27, 33–38; 2011c, p. 37–39, 123, 132).

In 2010, state-owned EMV decreased production of refined tin at the Vinto smelting and refining complex to 11,520 t compared with 11,800 t in 2009; the decrease could have been mostly owing to a decrease in the supply of tin in concentrates to Vinto from the Huanuni Mine. The Government planned to install a new tin-smelting furnace (together with Ausmelt Ltd. of Australia) and plant at Vinto with the capacity to produce between 17,000 and 18,000 t/yr of tin metal; the new plant was expected to be completed by sometime in 2012. Much of the expected increase in production of refined tin at Vinto could be dependent on completion of the expansion at the Huanuni Mine (ITRI Ltd., 2011c, d; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 7, 16–17, 33–38; 2011c, p. 55–57, 123, 132).

Industrial Minerals

Boron, Lithium, and Potash.—Construction of a pilot plant for lithium processing in the Salar de Uyuni was expected to be completed in 2010. There was no reported production of lithium in Bolivia, however, and it appeared that the plant had not yet been completed or started production by the end of the year. The pilot plant had been designed to have an output capacity of 500 t/yr of lithium carbonate, but initial production was expected to be only sample-sized volumes for testing. The Government's pilot lithium project was expected to be the first stage of a project eventually to produce lithium carbonate on a larger scale as well as other mineral resources from the salar, such as boron, magnesium, and potassium. The complex chemistry of the brines of the Salar de Uyuni, however, as well as environmental factors (such as possibly higher rainfall and lower rates of evaporation than in other salars where lithium is already produced), led at least some analysts to project that producing lithium carbonate on a commercial scale from this salar could be more challenging and costly than elsewhere. In addition to the lithium carbonate plant(s), COMIBOL expected to complete development of a mine and facilities that would have the capacity to produce about 12,000 t/yr of potash (potassium chloride) at the Salar de Uyuni by the end of 2011. The increases in the country's production of boric acid and ulexite in 2010 compared with that of 2009 were probably partly owing to greater exploration, development, and investment as part of the Government's lithium and potash development projects in the Salar de Uyuni (table 1; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 8, 14–15, 26–28; 2011c, p. 21–25, 66, 123, 146–147; Watts, 2011).

Mineral Fuels

Natural Gas and Petroleum.—Oil and gas companies and consultants surveyed by the Fraser Institute considered Bolivia to have the most substantial barriers to private investment in exploration for and production of crude petroleum and natural gas among 133 jurisdictions worldwide in 2010. According to YPFB, investment in Bolivia's hydrocarbons sector was about $800 million in 2010 compared with $612 million in 2009. Of the total investment in the sector in 2010, YPFB (headquarters) accounted for $108 million compared with $29 million in 2009; YPFB subsidiaries (including YPFB Andina S.A. and YPFB Chaco) accounted for $354 million compared with $332 million in 2009; and private companies (including those operating in Bolivia under operations contracts with state-owned YPFB, but excluding YPFB Andina and YPFB Chaco) accounted for $338 million (according to preliminary figures) compared with $251 million in 2009. Near the end of 2010, BG Group plc of the United Kingdom, PAE, and Repsol YPF, S.A. of Spain had reportedly agreed to invest $1.3 billion (combined) from 2011 through 2015 to expand output at the Margarita field and further develop the Huacaya field (Angevine, Brown, and Cervantes, 2010, p. 5, 15–16, 52; Mapstone, 2010; U.S. Energy Information Administration, 2011; Yacimientos Petrolíferos Fiscales Bolivianos, 2011, p. 38).

In March 2010, the Governments of Argentina and Bolivia agreed on gradual increases of natural gas exports to Argentina from the current maximum of 7.7 million cubic meters per day to about 19 million cubic meters per day by 2014, about 25 million cubic meters per day by 2019, and a maximum of about 27 million cubic meters per day by 2021. It was expected that most of the increase in production of natural gas in Bolivia to enable increasing exports to Argentina would have to come from the Margarita field. Also, increasing Bolivia's natural gas exports to Argentina to 27 million cubic meters per day would require completion of the Gasoducto del Noreste Argentino (GNEA) pipeline. By the end of 2010, however, Argentina's national energy company Energía Argentina Sociedad Anónima (ENARSA) was still attempting to tender a contract for constructing the GNEA pipeline. The smaller Juana Azurduy natural gas pipeline from the Margarita field to the Refinor refinery in Campo Duran, Argentina, was expected to be completed sometime in 2011 and eventually to be connected to the GNEA pipeline. In the meantime, the Juana Azurduy pipeline could allow Bolivia's exports of natural gas to Argentina to increase to a maximum of 10.4 million cubic meters per day by 2012 (Ore, Quiroga, and Garcia, 2010; Fox News Latino, 2011; U.S. Energy Information Administration, 2011).

Reserves and Resources

The reserves estimates in table 3 include proven and probable reserves as of the end of 2008 (where possible) and were compiled from company, Government, and other published sources. In 2009, the Government contracted with the Ryder Scott Co. petroleum consultants to quantify and certify Bolivia's reserves of natural gas and petroleum. Data on the country's reserves of natural gas and petroleum had apparently not been updated (at the national level) since 2005. In 2010, some controversy remained concerning the results of the Bolivian natural gas reserves assessment by Ryder Scott, which listed Bolivia's current proven natural gas reserves at about 300 billion cubic meters of natural gas compared with the previous figure of about 750 billion cubic meters (table 3; BP p.l.c., 2011b, p. 20; U.S. Energy Information Administration, 2011).

Ishihara and others (2011) estimated that the total amount of indium resources contained in Bolivian tin-polymetallic base-metal deposits could be more than 12,000 metric tons (t) of In content. They consider these resources to be inferred indium resources for Bolivia, however, and the figure may include some indium that had already been extracted. The figure also appears to include indium resources at inactive mines or in deposits that are not currently being mined. More accurate information concerning how much indium in the country might be (currently) economically exploitable without developing new mines or rehabilitating closed mines, or what current reserves of indium might be, was not available (table 3).

Outlook

Public and private investments in the mining, metallurgy, and oil and gas sectors during 2010 were not expected to have a significant effect on Bolivian mineral production during 2011 (compared with annual levels of production in either 2009 or 2010), but it could extend the productive lives of some mines that appeared to be producing close to estimated capacity. Many mines and other mineral production facilities were considered by Bolivia's Ministerio de Minería y Metalurgia to be producing close to capacity in either 2009 or 2010, including the Huanuni, the San Bartolomé, and the San Cristobal Mines; the Vinto tin smelting and refining facilities; and others. The Fraser Institute's ranking of Bolivia as a desirable destination for investment by private companies in the mining and quarrying sector was 76 out of 79 jurisdictions worldwide in 2011, and it appeared that the Government might have to take a leading role as an investor in the mineral industry to proceed with certain projects, such as expanding production of boron and developing the capacity to produce lithium carbonate and potash in the Salar de Uyuni (and investigating the possibility of doing the same in the Salar de Coipasa); expanding the production of mined tin at the Huanuni Mine; developing domestic capacity to produce primary refined zinc (and possible byproducts indium and cadmium); and restarting production of antimony metal at the Vinto antimony plant (McMahon and Cervantes, 2011, p. 7, 12, 43; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 6, 12, 16, 25–28, 36; 2011c, p. 17, 21–25, 62–63, 132–133; Watts, 2011).

In 2011, Bolivia could produce about as much lead, silver, and zinc as it did in 2009 if issues that contributed to the decreases in the country's 2010 production of these minerals do not recur and new (or similar) issues do not arise, such as public issues with water use at the San Cristobal Mine, Empresa Minera Manquiri continuing to be restricted to mine only below the elevation of 4,400 m above sea level at the San Bartolomé Mine on the flanks of Cerro Rico, and further (disruptive) public protests around these and other mines and facilities that produce lead, silver, or zinc in the country. In such a scenario, Bolivia could produce about 430,000 t of zinc in concentrates, 85,000 t of mined lead, and 1,300 t of mined silver in 2011. Production of mined silver and zinc in 2011 (and beyond) could be even slightly higher if Pan American Silver Corp. continues to increase production at the San Vicente Mine. In 2010, the San Vicente Mine produced 4,661 t of zinc in concentrates and about 94.3 t of silver in concentrates compared with 2,803 t and 81.7 t, respectively, in 2009; Pan American Silver expected to produce between 5,000 t and 5,800 t of zinc in concentrates and between about 99.5 t and 103 t of silver in concentrates at the San Vicente Mine in 2011. Ishihara and others (2011) estimated the indium content in a sample of ore from the San Vicente deposit to contain 1,290 ppm indium, which might indicate that concentrates produced at the San Vicente Mine could contain significant amounts of indium. If so, significant increases in production of zinc in concentrates at the San Vicente Mine could result in increases in the estimated run-of-mine production of indium in table 1 of this report (Coeur d'Alene Mines Corp., 2011, p. 2, 22–25; Sumitomo Corp., 2010b; Pan American Silver Corp., 2011, p. 26, 36).

Production of mined antimony already increased substantially in 2010, and Bolivia's capacity to produce antimony metal in the country could increase by about 6,000 t/yr of antimony metal (regulus) if the Government is successful in restarting the Vinto antimony plant (expected sometime in 2011). Because completion of the Ausmelt furnace at the Vinto tin plant was not expected until sometime during the second half of 2012, total production of tin metal in Bolivia could still be about 11,500 t in 2012, but could increase to 16,000 t in 2013, 17,000 t in 2014, potentially to 20,000 t in 2015, and possibly achieve an approximate maximum of 21,000 t of tin metal in 2016 (and afterward). After completion of the Ausmelt plant, the production capacity at Vinto could approach a maximum of about 32,000 t/yr of tin metal if EMV were to continue to use the older furnaces that it used to produce tin metal at Vinto in 2010; however, it does not appear that the company will have enough feed to run all the furnaces at Vinto at full capacity, and maintaining production from the older furnaces might not be cost effective. (It has been estimated that the production capacity at Vinto could reach as high as 38,000 t/yr if further modernization at Vinto were to be approved and implemented.) Initially, any increases in tin metal production were expected to be only from processing a greater percentage of mined tin domestically, because expansion of production to between an estimated 13,000 and 14,000 t/yr of tin in concentrates at the Huanuni Mine (where 2010 production capacity was estimated to be about 10,000 t/yr of tin in concentrates) was not expected to happen until sometime in 2014, and information concerning any other expansions of mined tin production was not available (ITRI Ltd., 2010a, b; 2011a–d; Metal Bulletin, 2011; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 6–7, 10, 16–17, 27–28, 32–34; 2011c, p. 37–39, 55–57, 66–67).

The Ministerio de Minería y Metalurgia reported a small amount of of iron ore and manganese production in 2010 (possibly from sampling and testing during the development of El Mutun), and Jindal expected that a marketable quantity of iron ore could be produced at El Mutun by 2012. Reliable information about what that possible marketable level of iron ore production could be or what the actual timeline to achieve consistently commercial levels of iron ore production at El Mutun might be, however, was not available. Production of crude steel, DRI, or sponge iron at El Mutun was not expected to take place until 2014, 2015, or later, and this timeline was still highly uncertain. Although many private companies had shown substantial interest in developing the lithium resources in the Salar de Uyuni, the Government decided to develop them itself. Reliable information concerning timelines for any possible marketable production of lithium in Bolivia was not available (Metal Bulletin, 2011; Ministerio de Minería y Metalurgia, Bolivia, 2011b, p. 8, 14–15, 17–18, 26–28, 33; 2011c, p. 21–25, 31–34, 66–67).

Petróleo Brasileiro S.A. (Petrobras) of Brazil expected to develop the new Itau field and to begin production of between 1 and 1.5 million cubic meters per day there sometime in 2011 and to ramp up production to about 5 million cubic meters per day by sometime in 2015. Also, the planned investment in the Margarita field by a private consortium was expected to increase production of natural gas to about 8 million cubic meters per day from about 2 million cubic meters per day in 2010. Reliable information concerning a definitive timeline for expansion of the Margarita field was not available. State-owned YPFB (together with private partners in operations contracts) planned to invest about $4 billion in development projects within the natural gas sector from 2009 through 2015 (Mapstone, 2010; Yacimientos Petrolíferos Fiscales Bolivianos, 2010, p. 21, 67; Petroleum Economist, 2011; U.S. Energy Information Administration, 2011).

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TABLE 1
BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010
METALS[3]						
Antimony:						
Mine output, Sb content		5,460	3,881	3,905	2,990	4,980
Metal, including Sb content of trioxide		2,782	2,862	2,984	2,340	419
Arsenic, mine output, arsenic trioxide, arsenic sulfide		120 [r]	--	74	115	155
Bismuth:						
Mine output, Bi content		155	147	28	54	87
Metal, smelter		1	(4)	92	73	--
Copper:						
Mine output, Cu content		218	606	731	882	2,063
Metal, primary		--	--	8 [e]	215 [r]	895
Gold:						
Mine output, Au content[5]	kilograms	9,628	8,818	8,405	7,217	6,394
Metal, including Au content of bullion and dore	do.	6,513	5,551	5,067	3,667	2,430
Indium, run of mine, In content[e]		70	75	65	50	60
Lead:						
Mine output, Pb content		11,955	22,798	81,602	84,538 [r]	72,803
Metal, smelter, primary		318	301	473	418	310 [6]
Silver:						
Mine output, Ag content[7]	kilograms	472,208	524,989	1,113,764	1,325,729 [r]	1,259,388
Metal, including Ag content of bullion and dore	do.	21,561	23,657	35,861	33,000 [e]	225,211
Tantalum, tantalite	do.	8,000 [e]	3,914	161	--	3,416
Tin:						
Mine output, Sn content		17,669 [r]	15,972	17,320	19,575 [r]	20,190
Metal, smelter		14,089	12,251	12,666	14,995	14,975
Alloys, Sn-Pb alloyed metal		1,030 [e]	473	--	--	--
Tungsten, mine output, W content		868	1,107	1,148	1,023	1,204
Zinc, mine output, Zn content		172,747	214,053	383,618	430,879	411,409
INDUSTRIAL MINERALS						
Barite		8,943	8,245	10,900	2,069	7,845
Bentonite		--	--	1	323	440
Borax		56 [e]	8,245	297	1,124	485
Boric acid		12,136	15,032	10,539	11,114	12,619
Cement, hydraulic	thousand metric tons	1,636	1,739	1,985	2,292	2,414

See footnotes at end of table.

TABLE 1—Continued
BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010
INDUSTRIAL MINERALS—Continued						
Gemstones, rough						
Amethyst[8]	kilograms	175,715 [9]	135,439 [r]	228,397 [r]	503,045 [r]	485,390
Ametrine	do.	33,675	8,933	20,629 [r]	10 [r]	669
Quartz, pink	do.	3,756	38	67	12,001	10,000 [e]
Emerald	do.	2,219	--	--	--	--
Gypsum, crude		617	4,458	4,108 [r]	1,931	556
Lime		80 [r]	75 [r]	75	26	111
Salt, natural, all types[e]		45,000	45,000	45,000	45,000	45,000
Of which, rock salt		688	1,545	1,415	1,947	1,218
Stone, natural:						
Flint	kilograms	4,427	25	--	--	--
Granite		119	205	-- [r]	62	44
Limestone as dimension stone		--	(4)	75	26	111
Marble		102	81	(4)	32	65
Slate (pizarra)		192	233	266	190	63
Sulfur, native		3	--	508	3	--
Ulexite		38,591	64,499	55,710	85,530	97,303
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	14,689	15,230	15,375 [r]	13,411 [r]	15,227
Marketable (net)	do.	13,434	14,301	14,895	12,787	14,923
Natural gas liquids	thousand 42-gallon barrels	2,694 [r]	2,862 [r]	2,645 [r]	2,541 [r]	3,022
Petroleum:						
Crude	do.	14,882	15,027	14,233	12,329 [r]	12,607
Refinery products:						
Liquefied petroleum gas	do.	855	895	685 [e]	645 [e]	945
Gasoline:						
Aviation	do.	28	32	25 [e]	20 [e]	25 [e]
Motor	do.	3,877	4,558	5,390 [e]	5,530 [e]	5,492
Jet fuel	do.	1,076 [r]	992	950 [e]	900 [e]	1,102
Kerosene	do.	153 [r]	131	130 [e]	100 [e]	127
Distillate fuel oil	do.	4,615 [r]	4,880	5,050 [e]	4,100 [e]	4,043
Lubricants:						
Oil, automotive	do.	102	105	100 [e]	80 [e]	100 [e]
Oil, industrial	do.	10	8	5 [e]	3 [e]	5 [e]
Greases[10]	do.	4	3	3 [e]	2 [e]	3 [e]
Asphalt[10]	do.	15	13	10 [e]	8 [e]	10 [e]
Paraffin oil[10]	do.	1	--	-- [e]	-- [e]	-- [e]
Total	do.	10,736	11,617	12,300 [e]	11,400 [e]	11,900 [e]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through January 23, 2012.

[2] In addition to the commodities listed, a variety of industrial minerals (clays, crushed and broken stone, dimension stone, and sand and gravel) are produced, but available information is inadequate to make reliable estimates of output.

[3] Unless otherwise specified, data represent actual production by Corporación Minera de Bolivia and small- and medium-sized mines.

[4] Less than 1/2 unit.

[5] May include production of metallic gold.

[6] Gross weight of primary metal alloys thought to contain lead.

[7] May include production of metallic silver.

[8] May include production by previously unregistered miners whose production was not officially accounted for prior to 2007.

[9] The units of the reported data were assumed to be in grams instead of kilograms (as was assumed in previous volumes of the Minerals Yearbook).

[10] Reported figures were converted from metric tons to equivalent barrels.

TABLE 2
BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Antimony		Empresa Minera Unificada S.A. (EMUSA) (private, 100%)	Caracota, Chilcobija, and Espiritu Santo Mines, Potosi Department	1,100.
Do.		Small-scale mining operations and cooperatives (private, 100%)	San Jose Mine, Oruro Department; Mines in Caracota District, Nor Chichas, Quijarro, and Sud Chichas Provinces, Potosi Department	4,500.
Antimony, metal (regulus)		Empresa Metalúrgica Vinto (Government, 100%)	Vinto antimony plant,[1] Carretera Vinto, Oruro Department	6,000.[2]
Antimony, metal		Operaciones Metalúrgicas S.A. (OMSA)	Huajara Industrial Park, east of the City of Oruro, Oruro Department	3,000.
Do.		Fundestaño de Oruro S.A. (Empresa Minera Unificada S.A., 100%)	City of Oruro, Oruro Department	1,100.
Antimony trioxide		Empresa Minera Bernal Hermanos S.A. (private, 100%)	Palala smelter, Tupiza, Potosi Department	1,900.
Bismuth		Cooperativa Minera Locatarios Tasna Ltda.	Tasna Mine, near City of Oruro, Oruro Department	200.
Bismuth, refined		Corporación Minera de Bolivia (COMIBOL) (Government, 100%)	Telamayu bismuth refinery, Telamayu, Potosi Department	350.
Do.		Empresa Metalúrgica Vinto (Government, 100%)	Vinto smelting complex,[1] Carretera Vinto, Oruro Department	90.
Cement	thousand metric tons	Sociedad Boliviana de Cemento S.A. (SOBOCE) (Grupo Cementos de Chihuahua S.A. de C.V., 47.02%, and other private, 52.98%)	El Puente (near city of Tarija), EMISA (near city of Oruro), VIACHA (near city of La Paz), and WARNES (near city of Santa Cruz) plants	1,510 cement; 760 clinker.
Do.	do.	Fábrica Nacional de Cemento S.A. (Sociedad Boliviana de Cemento S.A., 33.34%; Municipal Government of Sucre, 33.33%; Universidad San Francisco Xavier de Chuquisaca, 33.33%)	Cal Orcko industrial complex near city of Sucre, including grinding plant, and FANCESA cement plant near city of Chuquisaca	630 cement; 620 clinker.
Do.	do.	Cooperativa Boliviana de Cemento Ltda. (COBOCE)	Irpa Irpa Plant, near city of Cochabamba	470 cement; 330 clinker.
Do.		ITACAMBA Cemento S.A.	Plant, Santa Cruz Department	200 cement.
Copper		Compañia Minera PAS (Bolivia) S.A. (Pan American Silver Corp., 95%, and Empresa Minera Unificada S.A., 5%)	San Vicente Mine, Potosi Department	350.
Do.		Corporación Minera de Bolivia (COMIBOL) (Government, 100%)	Coro Coro Mine, and a pilot plant to produce copper cathodes, La Paz Department	3,000.
Do.		Small-scale mining operations and cooperatives (private, 100%)	Mining operations in Chuquisaca, La Paz, Oruro, and Potosi Departments	650.
Gemstones, ametrine		Minerales y Metales del Oriente S.R.L.	Anahi Mine, Santa Cruz Department	NA.
Gold	kilograms	Empresa Minera Paititi S.A. {Orvana Minerals Corp. [Fabulosa Mines Ltd. (Minera S.A., 100%), 52.5%, and other private, 47.5%], 100%}	Don Mario Mine,[3] Chiquitos Province, Santa Cruz Department	2,100.
Do.	do.	Golden Eagle International Inc. (private, 100%)	Cangalli Mine,[4] Santa Cruz Department	150.
Do.	do.	Grupo Minero La Roca S.A. (private, 100%)	La Paz Department	200.
Do.	do.	Mining Cooperatives (private, 100%)	Tipuani, Guanay, Mapiri, Huayta, Kaka, and Teoponte Rivers, La Paz Department	4,350.
Gold-silver dore, bullion	do.	Empresa Minera Inti Raymi S.A. (Compañía Procesadora de Minerales S.A., 88%, and Empresa Minera Unificada S.A., 12%)	Kori Chaca open pit mine and Kori Kollo leaching plant, near city of Oruro	2,300 gold; 1,800 silver.
Indium, run of mine		Sinchi Wayra S.A. (Glencore International AG, 100%)	Bolivar, Porco, and San Lorenzo Mines, Oruro and Potosi Departments	70.
Do.		Compañia Minera PAS (Bolivia) S.A. (Pan American Silver Corp., 95%, and Trafigura Baheer B.V., 5%)	San Vicente Mine, Potosi Department	15.
Do.		Compañia Minera Colquiri S.A. (Sinchi Wayra S.A., 100%)	Colquiri tin and zinc mine, Inquisivi Province, La Paz Department	5.
Lead		Sinchi Wayra S.A. (Glencore International AG, 100%)	Bolivar, Colquechaquita, Poopo, Porco, and San Lorenzo Mines, Oruro and Potosi Departments	15,000.[2]
Do.		Empresa Minera San Cristóbal S.A. (Sumitomo Corp., 100%)	San Cristobal Mine, southwestern Bolivia	82,000.

See footnotes at end of table.

TABLE 2—Continued

BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Lead—Continued		Small-scale mining operations and cooperatives (private, 100%)	Cerro Rico Mine, Potosi Department, and in areas immediately surrounding the San Cristobal Mine	10,200.
Do.		Empresa Minera La Solución Ltda.	Asientos and Monserrate lead-silver-zinc mines,[4] Cochabamba Department	610.
Do.		Empresa Minera Santa Lucia Ltda.	Santa Lucia lead-silver-zinc mine, Potosi Department	200.
Lead, metal		Empresa Metalúrgica Vinto (Government, 100%)	Vinto smelting complex, Carretera Vinto, Oruro Department	120.
Do.		Empresa Metalúrgica de Karachipampa (Atlas Minerals Inc., 65%, and Corporación Minera de Bolivia, 35%)	Karachipampa lead-silver smelter, and zinc refinery,[5] Potosi Department	30,000.
Natural gas	million cubic meters	Operated by Empresa Petrolera Andina S.A. (YPFB Andina S.A. [Government, 100%], 51.08%, and Repsol YPF, S.A., 48.92%) and owned by Empresa Petrolera Andina, S.A., 50%, Petróleo Brasileiro S.A., 35%, and Total S.A., 15%	Los Sauces, Rio Grande, Sirari, Vibora, and Yapacani fields, Santa Cruz Department	2,700.
Do.	do.	Operated by Petróleo Brasileiro S.A. (Petrobras) (Brazilian Government, 32.2%, and private, 67.8%), and owned by Empresa Petrolera Andina S.A., 50%; Petróleo Brasileiro S.A., 35%; Total S.A., 15%	Sabalo field, San Antonio Block; San Alberto field and Block, Tarija Department	7,200.
Do.	do.	Operated and owned by YPFB Chaco S.A. (Government, 100%)	Vuelta Grande field, Chuquisaca Department; Bulo Bulo, Carrasco, and Kanata fields, on the border of Cochabamba and Santa Cruz Departments	2,200.
Do.	do.	Operated by Repsol YPF, S.A., and owned by BG Group plc., 37.5%, Repsol YPF S.A., 37.5%, and Pan American Energy LLC (BP p.l.c., 60%, and BRIDAS Corp., 40%), 25%	Margarita field, Caipipendi Block, Tarija Department; Paloma field, Mamore Block, Cochabamba and Santa Cruz Departments	1,300.
Do.	do.	Operated and owned by BG Group plc., 100%	La Vertiente, Escondido and Taiguati fields, La Vertiente Block; Los Suris field and Block, all in Tarija Department	630.
Do.	do.	Operated by Pluspetrol Bolivia Corporation S.A. (owned by Pluspetrol S.A., 100%)	Bermejo and Madrejones fields, Tarija Department; Tacobo field, Santa Cruz Department	520.
Do.	do.	Operated by Vintage Petroleum Boliviana Ltda. (owned by Occidental Petroleum Corp., 100%)	Chaco Sur and Ñupuco fields, Tarija Department; Naranjillos field, Santa Cruz Department	350.
Petroleum	thousand 42-gallon barrels	Operated by Empresa Petrolera Andina S.A. (YPFB Andina S.A. [Government, 100%], 51.08%, and Repsol YPF, S.A., 48.92%) and owned by Empresa Petrolera Andina, S.A., 50%, Petróleo Brasileiro S.A., 35%, and Total S.A., 15%	Los Sauces, Rio Grande, Sirari, Vibora, and Yapacani fields, Santa Cruz Department	2,100.
Do.	do.	Operated by Petróleo Brasileiro S.A. (Petrobras) (Brazilian Government, 32.2%, and private, 67.8%), and owned by Empresa Petrolera Andina S.A., 50%; Petróleo Brasileiro S.A., 35%; Total S.A., 15%	Sabalo field, San Antonio Block; San Alberto field and Block, Tarija Department	7,500.
Do.	do.	Operated and owned by YPFB Chaco S.A. (Government, 100%)	Vuelta Grande field, Chuquisaca Department; Bulo Bulo, Carrasco, and Kanata fields, on the border of Cochabamba and Santa Cruz Departments	2,900.
Do.	do.	Operated by Repsol YPF, S.A., and owned by BG Group plc., 37.5%, Repsol YPF S.A., 37.5%, and Pan American Energy LLC (BP p.l.c., 60%, and BRIDAS Corp., 40%), 25%	Margarita field, Caipipendi Block, Tarija Department; Paloma field, Mamore Block, Cochabamba and Santa Cruz Departments	5,000.
Do.	do.	Operated and owned by BG Group plc., 100%	La Vertiente, Escondido, and Taiguati fields, La Vertiente Block; Los Suris field and Block, all in Tarija Department	610.

See footnotes at end of table.

TABLE 2—Continued

BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Petroleum — Continued	thousand 42-gallon barrels	Operated by Pluspetrol Bolivia Corporation S.A. (owned by Pluspetrol S.A., 100%)	Bermejo and Madrejones fields, Tarija Department; Tacobo field, Santa Cruz Department	160.
Do.	do.	Operated by Vintage Petroleum Boliviana Ltda. (owned by Occidental Petroleum Corp., 100%)	Chaco Sur and Ñupuco fields, Tarija Department; Naranjillos field, Santa Cruz Department	140.
Silver	kilograms	Empresa Minera San Cristóbal S.A. (Sumitomo Corp., 100%)	San Cristobal Mine, southwestern Bolivia	525,000.
Do.	do.	Empresa Minera Manquiri S.A. (Coeur d'Alene Mines Corp., 100%)	San Bartolomé Mine, by Cerro Rico, near Potosi Potosi Department	280,000.
Do.	do.	Small-scale mining operations and cooperatives (private, 100%)	Candelaria and other mines, Cerro Rico deposit, as well as in areas immediately surrounding the San Bartolomé Mine (under construction), Oruro and Potosi Departments	280,000.
Do.	do.	Sinchi Wayra S.A. (Glencore International AG, 100%)	Bolivar, Colquechaquita, Poopo, Porco, and San Lorenzo Mines, Oruro and Potosi Departments	180,000.
Do.	do.	Compañia Minera PAS (Bolivia) S.A. (Pan American Silver Corp., 95%, and Trafigura Baheer B.V., 5%)	San Vicente Mine, Potosi Department	100,000.
Do.	do.	Empresa Minera Santa Lucia Ltda.	Santa Lucia lead-silver-zinc mine, Potosi Department	30,000.
Do.	do.	Empresa Minera Paititi S.A. {Orvana Minerals Corp. [Fabulosa Mines Ltd. (Minera S.A., 100%), 52.5%, and other private, 47.5%], 100%}	Don Mario Mine,[3] Chiquitos Province, Santa Cruz Department	7,500.
Do.	do.	Empresa Minera La Solución Ltda.	Asientos and Monserrate lead-silver-zinc mines,[4] Cochabamba Department	2,000.
Silver, metal		Empresa Metalúrgica de Karachipampa (Atlas Minerals Inc., 65%, and Corporación Minera de Bolivia, 35%)	Karachipampa lead-silver smelter, and zinc refinery,[5] Potosi Department	310.
Do.		Empresa Minera Manquiri S.A. (Coeur d'Alene Mines Corp., 100%)	San Bartolomé Mine and plant, by Cerro Rico, near Potosi, Potosi Department	NA.
Do.		Empresa Metalúrgica Vinto (Government, 100%)	Vinto smelting complex, Carretera Vinto, Oruro Department	2.
Tin		Empresa Minera Huanuni [Corporación Minera de Bolivia (Government, 100%), 100%]	Huanuni Mine, Dalence Province, Oruro Department	10,000.
Do.		Compañia Minera Colquiri S.A. (Glencore International AG, 100%)	Colquiri tin and zinc mine, Inquisivi Province, La Paz Department	6,000.[2]
Do.		Empresa Minera Barrosquira Ltda. (private, 100%)	Caracoles Mine, Inquisivi Province, La Paz Department	500.
Do.		Small-scale mining operations and cooperatives (private, 100%)	Caracoles, Huanuni, Viloco, and other current or former Corporación Minera de Bolivia mines, in Oruro, Potosi, and La Paz Departments	10,000.
Tin, refined		Operaciones Metalúrgicas S.A. (OMSA)	Huajara Industrial Park, east of the City of Oruro, Oruro Department	3,360.
Do.		Empresa Metalúrgica Vinto (Government, 100%)	Vinto smelting complex, Carretera Vinto, Oruro Department	12,000.
Tin-lead alloys		do.	do.	200.
Tungsten, W content		Small-scale mining operations and cooperatives (private, 100%)	Bolsa Negra, Enramada, Reconquistada Mines, near the former International Mining Company's Chojilla Mine, Sud Yungas Province; Chambilaya and Chicote Grande Mines, Inquisivi Province; Mercedes, San Antonio, Ucumarini Mines, Larecaja Province, La Paz Department	1,200.
Zinc		Empresa Minera San Cristóbal S.A. (Sumitomo Corp., 100%)	San Cristobal Mine, southwestern Bolivia	270,000.
Do.		Sinchi Wayra S.A. (Glencore International AG, 100%)	Bolivar, Colquechaquita, Poopo, Porco, and San Lorenzo Mines, Oruro and Potosi Departments	205,000.[2]

See footnotes at end of table.

TABLE 2—Continued
BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Zinc—Continued	Small-scale mining operations and cooperatives (private, 100%)	Cerro Rico Mine, Potosi Department, and in areas immediately surrounding the San Cristobal Mine	85,000.
Do.	Compañía Minera Colquiri S.A. (Glencore International AG, 100%)	Colquiri tin and zinc mine, Inquisivi Province, La Paz Department	14,000.
Do.	Empresa Minera Santa Lucia Ltda.	Santa Lucia lead-silver-zinc mine, Potosi Department	12,000.
Do.	Compañía Minera PAS (Bolivia) S.A. (Pan American Silver Corp., 95%, and Trafigura Baheer B.V., 5%)	San Vicente Mine, Potosi Department	6,000.
Do.	Empresa Minera La Solución Ltda.	Asientos and Monserrate lead-silver-zinc mines,[4] Cochabamba Department	1,300.
Zinc, refined	Empresa Metalúrgica de Karachipampa (Atlas Minerals Inc., 65%, and Corporación Minera de Bolivia, 35%)	Karachipampa lead-silver smelter, and zinc refinery,[5] Potosi Department	150,000.

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1] There was no reported production of refined antimony or bismuth at the Vinto smelting complex in 2010. (Source: Ministerio de Minería y Metalurgia, Bolivia, 2011, Cuadro No. 9, Anuario estadístico minero metalúrgico 2010: La Paz, Bolivia, Ministerio de Minería y Metalurgia).

[2] Reported figure.

[3] An undisclosed proportion of the gold and silver production from this mine was in the form of metal contained in dore or bullion.

[4] Inactive during all of 2010.

[5] Inactive since completion of construction in 1985; through 2010.

TABLE 3

BOLIVIA: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity		Reserves	World ranking	World percentage
Antimony, metal content		310	4	15
Bismuth, metal content		10	3	3
Gold, metal content	metric tons	28	NA	(2)
Lead, metal content		1,600	8	2
Natural gas[3]	billion cubic meters	750	29	(2)
Petroleum[3]	million 42-gallon barrels	465	45	(2)
Silver, metal content	metric tons	22,000	8	5.5
Tin, metal content		400	6	7
Tungsten, W content		53	5	2
Zinc, metal content		6,000	9	3

NA Not available.

[1] Combined proven plus probable reserves estimated from a combination of company, Government, and secondary sources.

[2] Less than 1/2 unit.

[3] Proved reserves only. Source: U.S. Energy Information Administration, [undated], International energy statistics—Natural gas—Reserves: U.S. Energy Information Administration. (Accessed August 6, 2010, at http://tonto.eia.doe.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=3&pid=3&aid=6.)

THE MINERAL INDUSTRY OF BRAZIL

By Alfredo C. Gurmendi

In 2010, Brazil continued to be a leading producer of minerals in the world and marketed about 80 mineral commodities. The country was a leading producer of steel feedstocks, such as high-content iron ore and niobium, and the third ranked producer of, in terms of volume, aluminum, alumina, bauxite, and iron ore. Brazil has discovered a massive pre-salt area that contains almost 90 billion barrels (Gbbl) of crude oil but is located at depths of 5 to 7 kilometers (km) and under a layer of salt up to 2 km thick, so developing and producing fuels from these pre-salt fields would be costly. In 2010, Brazil's leading mineral exports were, in order of value, iron ore, gold, niobium, copper, manganese, bauxite, lead, and tin, and its leading imports were coal, potash, copper, and zinc, among others (Banco Central do Brasil, 2011b, p. 97, 107; Bray, 2011b; Departamento Nacional de Produção Mineral, 2011a, p. 6, 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Jorgenson, 2011; Papp, 2011a, b).

Minerals in the National Economy

Brazil's mineral sector—which included metals, industrial minerals, and mineral fuels, biofuels, and ethanol—continued to experience a phase of real growth as a result of new mineral projects and expansions. Consequently, Brazil was expected to remain among the global leaders in the production of mineral commodities and to continue to attract domestic and foreign investors in its mineral industry. According to the Banco Central do Brasil, the country experienced two quarters of recession in 2009 as world demand for Brazil's commodity-based exports and external credit decreased. After the global economic downturn, Brazil's economy returned to growth in the second half of 2009, and in 2010, the economic recovery had a positive effect on the credit, earnings, liquidity, and solvency of the domestic banking system and made the country an attractive destination for foreign investment. With the revival of consumer and investor confidence, and boosted by the recovery in exports, Brazil's real gross domestic product (GDP) increased by 7.5% in 2010 compared with a decrease of 0.6% in 2009. The mining and mineral processing industries contributed almost 3.6% of the GDP in 2010 compared with 2.4% in 2009, which was mostly attributable to the high international prices and increases in production of several mineral commodities, such as, in order of value, iron ore, petroleum, gold, copper, and lead. Of the total labor force of 102.2 million, the industrial sector employed 14.3 million (or 14%). Within the industrial sector, the mineral industry employed 786,500 (or 5.5%), of which 160,314 people were employed in mining, including 16,700 who were placer miners or garimpeiros (Banco Central do Brasil, 2011a, p. 4, 6–7; Departamento Nacional de Produção Mineral, 2011a, p. 2, 22–23; Economic Commission for Latin America and the Caribbean, 2011, p. 31; International Monetary Fund, 2011a, p. 15–16; 2011b, p. 61; U.S. Central Intelligence Agency, 2011).

Government Policies and Programs

The National Department of Mineral Production (DNPM) provided a document titled "Taxation of Mining Activities in Brazil—Analysis of Current Situation and of Changes Proposed for Tax Reform," using the November 1999 legislation as its guide. The purpose of the document was to inform the tax reform discussion underway in the Brazilian National Congress (2010–11) that was aimed at developing a new tax policy in line with the national interest and the growing globalization of the economy. In addition to changing the terms of concession contracts, the proposal would create a National Council of Mineral Resources to function as both a minerals regulator and advisor, with the purpose of increasing the royalties on mineral production. According to the Instituto Brasileiro de Mineração (IBRAM), the regulatory framework to be established for the pre-salt crude oil and natural gas reserves would influence the Government's proposed minerals regulation framework agreement as well. Currently (2010), the Mining Code [Decree-law (Act) No. 227 of February 28, 1967] governs all aspects of the mineral industry, from exploration to production and use of mineral resources, and establishes the rights and duties of the holders of mining rights. The Ministry of Mines and Energy's (MME) DNPM has responsibility for managing the county's mineral resources, for the inspection of the mineral activity in the country, and for enforcing the Mining Code and implementing its legal provisions. Decree-law (Act) No. 227 was amended by law No. 9314 of November 14, 1996, to provide greater flexibility for investment in the Brazilian mining sector. Article 7 stipulates that the production of minerals will depend upon the exploration authorization permit granted by the General Director of the DNPM and the development concession issued by the Minister of the MME. Licensing is a restricted system applicable exclusively to the production of industrial minerals (Departamento Nacional de Produção Mineral, 2011c; Instituto Brasileiro de Mineração, 2011b).

Article 20 of Brazil's Constitution (which was enacted on October 5, 1988) and Constitutional Amendments nos. 6 and 9, dated August 15, 1995, allow the participation of the private sector by means of joint ventures and private investment in the mining, natural gas, and petroleum sectors. The Government allows state-owned Petrobrás to enter into joint ventures with foreign investors and to invest overseas (Departamento Nacional de Produção Mineral, 2011c; Instituto Brasileiro de Mineração, 2011b).

The Agencia Nacional do Petróleo (ANP) is responsible for issuing exploration and production licenses and ensuring compliance with relevant regulations. Recent legislation concerning pre-salt exploration and production has changed the operating environment somewhat. The Brazilian Government released the proposed regulatory framework for the pre-salt reserves in August 2009. The framework consists of four pieces of legislation. The first two bills were signed into law in July 2010. The first law creates a new agency, Petrosal, to administer new pre-salt production. The second allows the Government to capitalize Petrobrás by granting the company 5 billion barrels (Gbbl) of unlicensed pre-salt oil reserves in exchange for a larger ownership share. The other two bills, which would establish a new development fund to manage Government revenues from pre-salt oil and lay out a new production-sharing agreement (PSA) system for pre-salt reserves, just passed by the Brazilian Congress in December 2010. Petrobrás would be the sole operator of each PSA and would hold a minimum 30% stake in all pre-salt projects (Departamento Nacional de Produção Mineral, 2011c; Empresa de Pesquisa Energética, 2011, p. 100–102).

The environmental licensing system is divided into three steps—a preliminary license, which is required during the planning stage; an installation license, which is required prior to any construction being done; and an operational license, which is required before beginning mining or processing operations. Decree No. 6848 of May 14, 2009, modifies Decree No. 4340 of August 22, 2002, to regulate the environmental compensation process (Instituto Brasileiro de Mineração, 2011b).

Brazil's import tax rates for minerals vary from 3% to 9%; the rate for ores and concentrates is 5% and that for other mineral derivatives is 7%. The export tax does not apply to exported mineral products, although there is a value-added tax. In most cases, the basis for assessment of corporate income taxes is the net profit for the fiscal year; the corporate tax rate ranges between 10% and 15% and is levied on the net profit. Profits may be expatriated. Equity ownership, which is allowed by means of privatization or by direct acquisition, may be as high as 100%. Since early 2007, the Concessions Law created additional opportunities for the private sector in public utilities previously reserved for the Government (Departamento Nacional de Produção Mineral, 2011c; Instituto Brasileiro de Mineração, 2011a, b).

In 2010, the IBRAM reported an investment of $321 million in mineral exploration compared with $234 million in 2009. The MME's Companhia de Pesquisa de Recursos Minerais (CPRM) (Geological Survey of Brazil) was developing programs for basic geologic mapping; geophysical, metallogenetic, and hydrogeologic mapping; and prospecting in areas of potential development. The CPRM was also creating programs for environmental geology, geologic hazards, and hydrogeology, and maintaining the country's geologic database and the corresponding economic analyses, particularly for coal, copper, diamond, gold, kaolin, nickel, peat, and zinc, to assist domestic and foreign investors in the mining sector (Companhia de Pesquisa de Recursos Minerais, 2011, p. 15, 19, 43; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a, b).

According to the CPRM, there are substantial mineral deposits to be discovered in Brazil. With only one-third of the country's territory mapped, CPRM was planning to map the entire country's geology. CPRM indicated that the chances of finding first class polymetallic deposits similar to the massive Carajas deposit in the State of Para were high, especially in the Amazon region. Carajas, which was the world's largest iron ore mine, holds an estimated 7.2 billion metric tons of iron ore resources (proven and probable) and produced about 100 million metric tons per year (Mt/yr). Vale was planning to increase Carajas's production to 130 Mt/yr by 2012. The Carajas iron deposit also holds high content of copper, gold, manganese, and nickel (Companhia de Pesquisa de Recursos Minerais, 2011; Vale S.A., 2011).

In 2010, the mining royalties collected by the Brazilian Financial Compensation for Exploiting Mineral Resources—Federal Royalty (CFEM) amounted to $556 million compared with $412 million in 2009. The CFEM rate is no more than 2% of the corporation's net profit. The prevailing rates are 3% for bauxite, manganese ore, potassium, and rock salt; 2% for coal, fertilizers, iron ore, and other minerals; 1% for gold (gold in prospecting is exempt); and 0.2% for other precious minerals and precious stones. The collected royalties are allocated among the municipalities, States, and the Federal Government in the proportion of 65%, 23%, and 12%, respectively. The Federal Government shares its 12% CFEM fund with the DNPM (9.8%); the Fondo Nacional de Desarrollo Cientifico y Tecnologico (FNDCT), which is a funding instrument for technological innovation benefiting all Brazil's productive sectors (2%); and the Brazilian Environment Agency (IBAMA) (0.2%) (Banco Central do Brasil, 2011a, p. 39; Departamento Nacional de Produção Mineral, 2011a, p. 24–26; 2011c; Instituto Brasileiro de Mineração, 2011a).

Brazil was the 7th ranked economy in the world and had implemented a set of economic and social policies that had produced tangible results for the country's economy. Brazil continued to participate in the BRICS (Brazil, Russia, India, China, and South Africa) economic forum, whose member countries, combined, accounted for 42% of the world's population, 26% of the world's land area, and 14.6% of the world's GDP in late 2010 (FinancialMirror, 2011).

Production

According to IBRAM, the value of Brazil's mineral production in 2010 was $39 billion compared with $24 billion in 2009. In the Americas, Brazil continued to be a leading producer of aluminum, bauxite, cement, ferroalloys, gold, iron ore, kaolin, lead, manganese, nickel, steel, and tin. Brazil's reportedly large mineral reserves and other identified resources help make it one of the leading mining countries in the Americas and the world (table 3; Departamento Nacional de Produção Mineral, 2011a, p. 3; Instituto Brasileiro de Mineração, 2011a).

Brazil's major integrated steel operations had a producing area of 28 mills [13 integrated (from iron ore) and 15 semi-integrated (from processing pig iron and scrap)] managed by 10 business groups; together, the mills had an installed capacity of 44.6 Mt/yr of crude steel. In 2010, Brazil's crude steel production amounted to 33 million metric tons (Mt) compared with 26.5 Mt in 2009. According to the Instituto Aço Brasil, the country was the seventh ranked producer of raw steel in the world and the leading producer in Latin America. Brazil was the third ranked iron ore producer in the world after China and Australia with an output of 372.1 Mt; Vale S.A. produced 297 Mt, or 79.8% of Brazil's iron ore production

(Departamento Nacional de Produção Mineral, 2011b; Instituto Aço Brasil, 2011; Vale S.A., 2011).

Mineração Rio do Norte S.A. (MRN), the majority of which was privately owned, was the world's third ranked bauxite producer and exporter; it produced 16.8 Mt in 2010, which was about 53% of the country's total revised bauxite production of 31.7 Mt, followed by Vale, which produced almost 24%, or about 7.5 Mt. Brazil produced 25 Mt of pig iron in 2010 compared with 22 Mt in 2009 (table 1; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011b; Vale S.A., 2011).

In 2010, Petrobrás continued to operate in an integrated fashion in the segments of exploration and production, refining, crude oil and natural gas trade and transportation, petrochemicals and derivatives, electric energy, and biofuel and other renewable energy source distribution. Petrobrás was a leader in the Brazilian petroleum sector and had a presence in 28 countries. The company expected to achieve self-sufficiency in crude oil and natural gas production and aimed to be among the top five integrated energy companies in the world by 2020. The company's 2010–14 business plan foresees investments in the order of $174.4 billion, of which about 90% would be invested in the country and 10% would be invested overseas. Petrobrás was also planning to make domestic investments of $42 billion to develop its pre-salt petroleum resources in the Atlantic zone. It was expected that Brazil's total crude oil production would be 33.3 million barrels per day (Mbbl/d) by 2013.

Brazil's diversified mineral endowment, competent labor force, and macroeconomic policies continued to attract investor interest in the country's mining and petroleum industries in spite of the past (2008–9) global economic crisis. Leading international mining, petroleum, and steel companies were notably interested in, in order of value, crude oil and gas, iron ore, steel, coal, gold, copper, and diamond (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a).

Structure of the Mineral Industry

Brazilian corporations, which included those owned by private Brazilian and foreign investors and by the Government, partially or wholly owned the major portion of the mineral and petroleum sectors. In 2010, the DNPM had 7,809 companies [including more than 500 transnational corporations (TNCs) recorded in its annual mining report] that had established operations in Brazil owing to the country's favorable policies on mergers, joint ventures, and privatization. The competitiveness of Brazil's mineral industry resulted from investments in new technologies to improve efficiencies and productivity, particularly in, in order of value, the mining, crude oil and natural gas, and steel sectors (Instituto Brasileiro de Mineração, 2011a, b; Departamento Nacional de Produção Mineral, 2011b, c).

In 2010, the integrated energy company Petrobrás was composed of the following related units: Petrobrás Química, S.A., which had integrated refining-petrochemical operations; Petrobrás Distribuidora S.A., which distributed petroleum products in Brazil; Petrobrás International Braspetro B.V., which handled international operations; Petrobrás International Finance Co., which facilitated the import of crude oil and derivatives; Petrobrás Gás S.A., which was responsible for trading Brazilian and imported natural gas and fertilizers; Petrobrás Transporte S.A., which constructed and operated the facilities, pipelines, terminals, and vessels needed for the transportation and storage of crude oil and derivatives, natural gas, and bulk products; Downstream Participações S.A., which facilitated asset exchange between Petrobrás and Repsol YPF S.A. of Spain's subsidiary in Argentina for refining and distribution, among other subsidiaries. In 2010, Petrobrás' operations around the world included those in Angola, Argentina, Bolivia, Chile, China, Colombia, Cuba, Ecuador, Japan, Mexico, Namibia, Netherlands, Nigeria, Paraguay, Peru, Portugal, the United Kingdom, and the United States, among others. In addition, the Brazilian cement companies Holcim (Brasil) S.A, Lafarge (Brasil) S.A., Votorantim Cimentos S.A., and others owned 39 cement plants in eight Brazilian States and accounted for more than 75% of the national output of more than 59.1 Mt. Among these cement plants, 12 were located in the State of Minas Gerais and 9 were located in the State of Sao Paulo (tables 1, 2; Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011b).

Since 2000, TNCs had accounted for almost $400 billion in registered investment with the Banco Central do Brasil. Planned investments in the mineral sector during 2010–14 amounted to $62 billion. Among the major TNCs operating in Brazil were Anglo American plc, BHP Billiton plc, and BP p.l.c. of the United Kingdom; De Beers Group of South Africa; and Glencore International AG of Switzerland (Banco Central do Brasil, 2011b, p. 91; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

In 2010, the active international mining and oil companies in Brazil included Alcan Aluminum Ltd., Barrick Gold Corp., and Teck Cominco Inc. of Canada; Shanghai Baosteel of China; Royal Dutch/Shell Group (Shell) of the Netherlands; Energia de Portugal; Iberdrola S.A. and Repsol of Spain; Anglo American, BHP Minerals International Exploration Inc. (BHP Billiton Ltd., 100%), and Rio Tinto plc of the United Kingdom; and Chevron Corp. (ChevronTexaco Brasil S.A.), Dow Chemical Co., Exxon Mobil Corp. (Esso Brasileira de Petróleo Ltda.), Freeport-McMoRan Copper & Gold Inc., Newmont Mining Corp., and Placer Dome U.S. Inc. of the United States (table 2; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

In 2010, three international cement companies—Cimentos de Portugal, SGPS, S.A. (Cimpor) of Portugal; Lafarge S.A. of France; and Holcim Ltd. of Switzerland—were active in Brazil. According to the DNPM, 36 iron ore mining companies were operating 53 mines and 54 processing plants in the country. There were about 2,500 mineral mines in Brazil, which were classified conforming to their run-of-mine outputs: large mines—between 1 Mt/yr and 3 Mt/yr or higher; medium mines—between 100,000 metric tons per year (t/yr) and 1 Mt/yr; and small mines—between 10,000 and 100,000 t/yr (Departamento Nacional de Produção Mineral, 2011a).

In 2010, Brazil produced about 460,000 gigawatthours (GWh) of electric power and consumed about 420,000 GWh. Brazil's domestic energy supply encompassed the following: hydroelectric, 74%; natural gas, 6.8%; imports, 6.5%;

biomass, 4.7%; oil products, 3.6%; nuclear, 2.7%; and others, 1.7% (Departamento Nacional de Produção Mineral, 2011b; Empresa de Pesquisa Energética, 2011, p. 14, 21; U.S. Energy Information Administration, 2011).

Mineral Trade

Brazil was the leading economy in Latin America and a member of the Mercado Común del Cono Sur (MERCOSUR), which was the second largest trade association in the Americas and the eighth worldwide. In 2010, exports were valued at almost $202 billion, and imports, $182 billion compared with $153 billion and $128 billion, respectively, in 2009. Brazil's mineral sector had a trade surplus of $27.6 billion compared with revised $15.6 billion in 2009 (Banco Central do Brasil, 2011b, p. 91–92; Departamento Nacional de Produção Mineral, 2011a, p. 9; Instituto Brasileiro de Mineração, 2011a).

The mineral industry contributed significantly to the country's trade balance. In 2010, Brazil exported iron ore and concentrates (valued at $28.9 billion), gasoline and petroleum ($14.2 billion), flat-rolled products ($6 billion), ferroalloys ($5.8 billion), aluminum and aluminum products ($3.5 billion), gold in bars ($1.8 billion), ferroniobium (iron-niobium) ($1.6 billion), copper ($1.2 billion), pig iron ($971 million), and tubes and cast iron ($860 million) (Banco Central do Brasil, 2011b, p. 97; Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Alumina production increased to more than 8 Mt from a revised 7.8 Mt in 2009, or by almost 3%. Exports of alumina totaled more than 6.4 Mt compared with more than 5.5 Mt in 2009. Primary aluminum production remained at about the same level as that of 2009 (1.5 Mt). Companhia Brasileira de Alumínio (CBA) produced about 31% of Brazil's primary aluminum; Alumínio Brasileiro S.A. (Albras), 29.5%; Alcoa Inc., 22.5%; BHP Billiton plc, 11.4%; and others, 5.6%. In 2010, exports of aluminum totaled 760,000 metric tons (t) valued at about $1.7 billion compared with 926,000 t valued at about $2.7 billion in 2009. Brazil's imports of all forms of aluminum totaled 104,000 t valued at about $212 million in 2010 compared with 201,000 t valued at about $457 million in 2009. Bauxite production increased to 31.7 Mt in 2010 from almost 28.1 Mt in 2009. The MRN accounted for about 53% (16.8 Mt) of the total bauxite production for 2010. Exports amounted to about 6.8 Mt of bauxite compared with more than 3 Mt in 2009. According to the Associação Brasileira do Alumínio, Brazil's consumption of aluminum products by end use were as follows: packaging (30%), transports (28%), electrical (12%), construction (10%), consumer durables (9%), machinery (4%), and others (7%). Brazil was the sixth ranked aluminum producer in the world after China, Russia, Canada, Australia, and the United States (Associação Brasileira do Alumínio, 2011; Bray, 2011a, b; Departamento Nacional de Produção Mineral, 2011b).

Copper.—Brazil's copper production in concentrate increased slightly to 213,548 t in 2010 from a revised 211,692 t in 2009. The leading producers were Vale, with 116,813 t of the concentrate from its Sossego Mine in Carajas, State of Para, and Mineração Caraiba S/A, with 23,311 t from its deposit in Jaguari, State of Bahia. In 2010, Caraiba Metais S/A (CMSA) of Camacari, State of Bahia, which was the only electrolytic copper producer in Brazil, produced almost 219,800 t of primary copper metal compared with 217,600 t in 2009. In 2010, Brazil imported 467,870 t of copper ore, equivalent to 140,343 t of copper metal content mostly from Chile (93%) and Portugal (5%); 251,975 t of copper cathode mostly from Chile (80%) and Peru (18%); 60,669 t of manufactured copper products from Chile (58%), China (14%), and Peru (9%). CMSA was planning to produce about 500,000 t/yr of electrolytic copper in D'Avila, State of Bahia, by 2011 (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

In 2010, Vale's copper project portfolio produced 207,000 t of concentrate compared with 198,000 t in 2009, or an increase of 4.5%. Vale's copper projects included the sulfide ore resources of, in order of volume, the Sossego, the Salobo, the Alemao, and the Cristalino deposits, and the oxidized ore deposit of Project 118; all these projects are located in the mineral province of Carajas, State of Para. Vale's subsidiary Salobo Metais S/A was conducting a feasibility study for the Salobo copper project, which was expected to be completed by 2012; development of the project would require an investment of $1.2 billion. Salobo was expected to produce 520,000 t/yr of copper in concentrate and 255,000 t/yr of metal copper by 2013. The Salobo project in Maraba, State of Para, was Brazil's largest copper deposit and could support a 520,000-t/yr-capacity mill. In 2010, Vale produced 10,000 t/yr of preliminary copper cathode from Project 118 and was planning to produce 38,000 t/yr by 2015 (Departamento Nacional de Produção Mineral, 2011b; Vale S.A., 2011).

Vale's Cristalino copper deposit was in the process of a feasibility study; afterwards it was expected to produce 30,000 t/yr of copper concentrate by 2015 with an investment of $500 million. Vale continued to conduct intensive geologic prospecting to identify new copper areas in the Carajas District. Mineração Maracá S/A completed a feasibility study for the Chapada copper-gold-silver project in Alto Horizonte, State of Goias. The estimated ore reserves amounted to 434.5 Mt containing 1.3 Mt of copper and 9.6 t of gold. The Chapada Mine was projected to produce 51,000 t/yr of copper concentrate, 2.8 t/yr of gold, and 6.1 t/yr of silver by 2012 (Departamento Nacional de Produção Mineral, 2011b; Vale S.A., 2011).

Gold.—Gold production increased to 62 t in 2010 from a revised 60 t in 2009, or by more than 3%; mining companies produced 55.6 t (89.5%), and garimpeiros produced 6.5 t (10.5%). In 2010, the leading producing companies were Kinross Gold Corp. (29%), AngloGold Ashanti Mineração Ltda. (22%), Yamana Gold Inc. (17%), Gold Digging (12%), and Jaguar Mining (7%), and others (13%). The leading producing States were Minas Gerais (64%), Bahia (11%), and Para (3%) (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

Iron Ore and Iron and Steel.—Brazil produced 372.1 Mt of beneficiated iron ore in 2010 compared with a revised 298.5 Mt in 2009, which was an increase of about 24.7%. Of that production, the leading iron ore producer was Vale (79.8%); other producers, such as Companhia Siderúrgica Nacional (CSN), Minerações Brasileiras Reunidas S/A (MBR), and Samarco Mineração S/A contributed the remaining 20.2%. In 2010, Brazil exported about 258.8 Mt of iron ore valued at almost $21.4 billion. The leading importers of Brazilian iron ore were China (46%); Japan (11%); Germany (7%), the Republic of Korea (4%); and France (3%) (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

Ferroalloys production increased to almost 1.1 Mt from a revised 831,121 t in 2009, or by more than 26.3%. Vale's ferroalloys production increased to 207,000 t in 2010 compared with 99,000 t in 2009, or by 109.1%. Brazil's Prometal Produtos Metalúrgicos S.A. and Norway's Elkem A/S produced 210,000 t of ferromanganese in 2010 compared with a revised 154,000 t in 2009. The prometal project, in which Elkem held a 40% share, was located in Maraba, State of Para. The manganese was supplied by Vale's Mina do Azul, and the iron ore was from Vale's Serra dos Carajas Mine (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

Brazil produced 32 Mt of pig iron in 2010 compared with 35 Mt in 2009, which was a decrease of almost 8.6%. Brazil was the fifth ranked producer after China, Japan, Russia, and India (Departamento Nacional de Produção Mineral, 2011a, p. 10; 2011b; Fenton, 2011).

Raw steel production increased to 33 Mt in 2010 from 26.5 Mt in 2009, or by more than 24.7%. Brazil exported 7.9 Mt of steel valued at $5 billion in 2010 compared with 7.5 Mt of steel valued at $6.5 billion in 2009. The major recipients of Brazil's exports were the United States (45%); Mexico, the Republic of Korea, Taiwan, and Thailand (6% each); and Argentina, Chile, Colombia, and Spain (4% each). Brazil imported about 4.7 Mt of steel valued at $4.3 billion compared with more than 3 Mt of steel valued at almost $4.5 billion in 2009. More than 60% of China's exports to Brazil were of metal-mechanic goods. The apparent domestic consumption of steel in Brazil was about 24.6 Mt compared with 27.2 Mt in 2009, which represented a decrease of about 9.6%. The Brazilian steel industry's investments amounted to $34.1 billion during the period 1994 through 2010. New steel facilities could be added, which would represent an additional investment of more than $5 billion by 2013. After the effects of the past (2008–9) global economic crisis, however, investors in the sector were revising the implementation process for their new projects (Departamento Nacional de Produção Mineral, 2011a, p. 10–11; 2011b; Fenton, 2011; Instituto Aço Brasil, 2011).

Manganese.—Manganese production in concentrate (MnO_2) increased to about 2.6 Mt in 2010 from a revised 2.3 Mt in 2009. Rio Doce Manganês S.A.'s (RDM) (a wholly owned subsidiary of Vale) manganese mines in the States of Minas Gerais (Morro da Mina) and Para (Mina do Azul) produced about 1.8 Mt of manganese ore and 207,000 t of ferroalloys (ferromanganese) in 2010 compared with 1.7 Mt of manganese ore and 223,000 t of ferroalloys (ferromanganese) in 2009. In 2010, domestic consumption of manganese was as follows: manganese ferroalloys, 90%, and electrical batteries, 10% (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

Nickel.—Brazil produced 108,983 t of nickel content in ore in 2010 compared with revised 41,059 t in 2009; production of electrolytic nickel was 19,111 t in 2010 compared with a revised 16,598 t in 2009; nickel in ferronickel alloys decreased to 8,465 t in 2010 from a revised 9,427 t in 2009; nickel in matte increased to 14,308 t in 2010 from a revised 8,518 t in 2009; and nickel in carbonates increased to 30,161 t in 2010 from a revised 16,766 t in 2009. Vale produced 179,000 t of nickel in 2010 compared with 187,000 t in 2009. In 2010, Anglo American initiated operations in its Barro Alto nickel project in the State of Goias. The company planned to produce 150,000 t/yr of nickel as concentrate content by 2012. In 2010, Vale invested $430 million to use a high-pressure acid-leaching technology to produce 25,000 t/yr of nickel from its Ourilandia project in Carajas, State of Para. Vale was also focused on the development of the Onca Puma nickel laterite project in the State of Para, and would invest a total of $2.3 billion in the project to produce 53,000 t/yr of nickel metal. With these additional projects, the production of nickel ore in Brazil was expected to increase by 200,000 t/yr in 2011 (table 1; Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a; Vale S.A., 2011).

Zinc.—Brazil produced 211,203 t of zinc content in concentrates in 2010 compared with a revised 172,688 t in 2009. Primary metal production increased to 288,107 t in 2010 from a revised 242,136 t in 2009; the increase represented almost 93% of the installed annual metal capacity of 310,000 t. Grupo Votorantim (GV) was the only producer of zinc in Brazil. Production was through GV's two mines (Paracatu and Vazante) and two metallurgy operations (Juiz de Fora and Tres Marias) located in Minas Gerais State. GV produced 217,000 t of zinc metal mainly from domestic concentrates treated at the Tres Marias metallurgical and Juiz de Fora plants, which had the capacities to produce 180,000 t/yr and 110,000 t/yr of zinc metal, respectively, and 71,107 t of zinc metal entirely from imported concentrates (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a; Votorantim Group, 2011).

Industrial Minerals

Asbestos.—In 2010, Brazil produced 302,257 t of asbestos (fiber content) compared with revised 288,452 t in 2009. Brazil's significant asbestos deposits are located in Cana Brava and Minacu in the State of Goias; Goias was the only producing State in the country. Sociedade Anônima Mineração de Amianto was planning to increase its production capacity to 350,000 t/yr from 230,000 t/yr by 2013 and would continue to supply 90% of Brazil's asbestos for the manufacture of specialized cement products, which were, in order of economic importance, ceiling tiles, protective screens, water and sewer pipes, water tanks, and molded electrical insulators. Other uses were, in order of value, thermal insulators, paper and cardboard, slabs, decorations, insecticide, asphalt for highways and airport runways, and automobiles. Asbestos mining and consumption were highly regulated in most industrialized nations and the use of asbestos continued to decline owing to health hazards. In 2010, Brazil was the third ranked world producer of asbestos after Russia and China (Departamento Nacional de Produção Mineral, 2011b; Virta, 2011).

Gemstones.—In the Americas, Brazil and Guyana followed Canada as the leading producers and traders of mostly alluvial diamond. In 2010, Brazil continued to be one of South America's leading gemstone producers and exporters. Many different varieties of gemstones are found in the Araxa, the Bambui, and the Canastra geologic groups; these include, in order of value (U.S. dollars per carat), diamond, emerald, aquamarine, topaz, tourmaline, opal, chrysoberyl, amethyst, citrine, and agate. Brazil was the world's only source of some quality gemstones, such as imperial topaz and Paraiba tourmaline. In 2010, 52% of the diamond and gemstones was mined by mining companies and 48% was mined by garimpeiros. According to the DNPM's Mineral Summary Statistics for 2006–9, Brazil's diamond production from year to year had been uncertain, and annual production had been declining since 2007. The leading State producers were Mato Grosso (47%), Minas Gerais (43%), Bahia (4.9%), Piaui (2.9%), Parana (1.9%), and Goias (0.3%). The carats produced and reported conformed to the Kimberley Process Certification Scheme's (KPCS) guidelines (table 1; Departamento Nacional de Produção Mineral, 2011b; Olson, 2011).

In 2010, Brazil exported 20,037 carats valued at $3.3 million; the major markets for Brazilian rough diamond were Belgium (93.2%), Israel (3.4%), China (2.3%), and India (1.1%). Brazil imported 21,747 carats valued at $382.7 million. About 98.5% of the imports was diamond (industrial) valued at $135.5 million from the United States and 1.5% was uncut stones valued at $247.2 million from the European Union, particularly from Belgium (Departamento Nacional de Produção Mineral, 2011a).

Phosphate Rock.—Production of phosphate rock (concentrates) amounted to 6.2 Mt in 2010 compared with a revised 6.1 Mt in 2009. The leading mining companies, in order of percentage of the country's total reserves (340 Mt) were Vale (25%), Fosfértil S.A. and Ultrafértil S.A. (20% each), and Bunge Fertilizantes S.A. (15%) in Minas Gerais, and Copebras S.A. (6%) in Sao Paulo; together they represented 86% of the total reserves in 2010. The reported imports of concentrates amounted to 1.4 Mt in 2010 compared with 0.9 Mt in 2009. The reported domestic consumption of concentrates was about 7.6 Mt in 2010 compared with 7 Mt in 2009. Of the total phosphoric acid produced, 96% was used in the fertilizer industry and 4% was used in the chemical industry (Departamento Nacional de Produção Mineral, 2011b; Instituto Brasileiro de Mineração, 2011a).

Mineral Fuels and Other Sources of Energy

Brazil had expanded its crude oil, natural gas, and electricity consumption in recent years. The country was the 9th ranked energy consumer in the world and the 3d ranked in the Western Hemisphere, after the United States and Canada. Total primary energy consumption in Brazil had increased by more than 30% in the past decade owing to the country's sustained economic growth. Increasing the country's crude oil production, however, had been a long-term goal of the Brazilian Government, and recent offshore exploration in Brazil had resulted in massive discoveries of large pre-salt crude oil deposits, which could transform Brazil into one of the leading crude oil producers in the world. Total Brazilian energy consumption increased to 10.6 quadrillion British thermal units (BTU) in 2010. The largest share of Brazil's total energy consumption came from oil and other liquids (50%, including ethanol), followed by hydroelectricity (34%) and natural gas (8%). Although natural gas was a small share of total energy consumption, attempts to diversify electricity generation from hydropower to gas-fired powerplants could cause natural gas consumption to increase in the coming years. Also, attempts to diversify electricity generation, ranging from hydropower and renewable energy (biomass, ethanol, solar, and wind) to natural gas powerplants, could increase the consumption of natural gas (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Coal.—In 2010, Brazil produced 6.3 Mt of beneficiated coal compared with a revised 5.8 Mt in 2009. The Brazilian coal industry's mine operations were concentrated in the three southernmost States of Rio Grande do Sul (54.8%), Santa Catarina (43.7%), and Parana (1.5%). Coal demand increased mainly because the thermoelectric plants were operating at full capacity in these three States (Departamento Nacional de Produção Mineral, 2011b).

To meet Brazil's coal (coke, metallurgical) demand, 19.5 Mt was imported in 2010 compared with 14.5 Mt in 2009. Imports came from the United States (37%), Australia (27%), Colombia (10%), Canada (8%), China (5%), and other countries (13%). In 2010, Brazil's usage of coal was 81% to generate electric energy and 19% for industrial use (cellulose, 3.8%; petrochemicals, 3.3%; the food industry, 1.5%; ceramic, 1.3%; and others, 9.1%) (Departamento Nacional de Produção Mineral, 2011b).

Natural Gas, Petroleum, and Other Sources of Energy.—In 2010, Brazil's gross natural gas production amounted to 22.9 billion cubic meters. Natural gas constituted only a small portion of Brazil's energy consumption. The largest share of Brazil's natural gas production took place in offshore fields in the Campos Basin (10 billion cubic meters) and the State of Rio de Janeiro (8 billion cubic meters). Most onshore production took place in the States of Amazonas and Bahia and was mostly for local consumption because of the shortage of transportation infrastructure. To meet increasing demand and to decrease reliance on imports, Petrobrás planned to bring several new natural gas projects online during the course of the coming years. Also, the pre-salt areas were estimated to contain sizable natural gas reserves as well. According to Petrobrás, Tupi alone could contain between 140 and 200 billion cubic meters of recoverable natural gas, which, if proven, could increase Brazil's total natural gas reserves by 50% (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

In 2010, Brazil's total natural gas proven reserves were estimated to be 824.7 billion cubic meters. Brazil imported natural gas from Bolivia by way of the 2,000-mile Gasbol pipeline, which links Santa Cruz, Bolivia, to Porto Alegre, Brazil, by way of Sao Paulo. Bolivia accounted for 96% (8.4 billion cubic meters) of Brazil's total natural gas imports. Brazil had two liquefied natural gas (LNG) regasification terminals, both installed in the past 2 years (2009–10); they were the Pecem terminal in the northeast and the Guanabara Bay terminal in the southeast. Both facilities were floating regasification and storage units operated by Golar LNG, with a combined capacity of 210 million cubic meters per day. According to ANP, Brazil received 4 million cubic meters of natural gas in the form of LNG in 2010, mostly from Trinidad and Tobago (Departamento Nacional de Produção Mineral, 2011b; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Petrobrás was the dominant participant in Brazil's petroleum sector, holding important positions in upstream, midstream, and downstream activities. In 2010, according to the Brazilian Empresa de Pesquisa Energética, Brazil's crude oil reserves amounted to 28.5 Gbbl at yearend 2010, which ranked it second in reserves in South America after Venezuela. The offshore Campos and Santos Basins, which are located off of the country's southern coast, hold the vast majority of Brazil's proven reserves. Brazil's crude oil production had risen steadily in recent years, and the country's oil production in 2010 was about 2.1 Mbbl/d of liquids, or about 5% higher than in 2009. More than 90% of Brazil's oil production was from offshore in very deep water and consisted of mostly heavy grades. Five fields in the Campos Basin (Barracuda, Marlim, Marlim Leste, Marlim Sul, and Roncador) accounted for more than 50% of Brazil's crude oil production. These Petrobrás-operated fields each produced between 100,000 and 400,000 barrels per day (bbl/d). International oil companies also played a role in Brazilian production. The Shell-operated Parque de Conchas project and the Chevron-operated Frade project were expected to achieve production levels of 100,000 bbl/d and 68,000 bbl/d, respectively, by 2014. As pre-salt discoveries boost Brazilian production in the medium and long terms, crude oil exports are likely to increase steadily (BP p.l.c., 2011, p. 6–8, 20–22; Empresa de Pesquisa Energética, 2011, p. 38; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Brazil's exports of crude oil amounted to about 640,000 bbl/d in 2010 compared with 525,700 bbl/d in 2009; however, this export growth could be moderated by increases in domestic consumption driven by rapid economic growth. Brazil still imported some light crude oil to meet the needs of its refineries. Imports of crude oil decreased to 123.7 Mbbl in 2010 from 136.9 Mbbl in 2009. The leading import sources were Nigeria (45%), Algeria (15%), and Saudi Arabia (10%) (BP p.l.c., 2011, p. 6–8, 20–22; Empresa de Pesquisa Energética, 2011, p. 38; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Petrobrás was considering developing future subsea technology solutions for its crude oil and natural gas projects offshore Brazil, which would include the development of subsea production systems to address the challenges associated with Petrobras' pre-salt crude oil and natural gas fields and the design of subsea processing technologies that could increase recovery rates at Petrobrás' maturing crude oil and natural gas fields (Petróleo Brasileiro S.A., 2011a).

Petrobrás had also started numerous ethanol pipeline projects, including one that runs from Goias State to Sao Paulo State. BP Brasil Ltda. was involved in the Edia ethanol project in Goias State, which produced 7,500 bbl/d of ethanol in 2010; ethanol was produced from sugar cane that grows in Brazil's tropical climate. In 2010, Petrobrás' foreign exploration for and production of mineral fuels took place in Angola, Argentina, Bolivia, Colombia, Ecuador, Nigeria, Peru, the United States, and Venezuela (BP p.l.c., 2011, p. 6–8, 20–22; Empresa de Pesquisa Energética, 2011, p. 38; Petróleo Brasileiro S.A., 2011a; 2011b, p. 62–63).

Brazil's largest oil discoveries in recent years had come from the Atlantic offshore pre-salt basins. Petrobrás' pre-salt Tupi/Iracema pilot project in the Santos Basin was planned to produce 100,000 bbl/d of crude oil and 5,000,000 cubic meters per day of natural gas during 2011 and 2012. The Tupi/Iracema deposit was expected to enter into its final development phase by 2017. The project was a consortium of Petrobrás (65%, operator), BG Group plc of the United Kingdom (25%), and Brazil's Galp Energia S.A. (10%) to carry on the project's evaluation plan, which was approved by the Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (Empresa de Pesquisa Energética, 2011, p. 39–40; Petróleo Brasileiro S.A., 2011b, p. 36, 62–63; U.S. Energy Information Administration, 2011, p. 1, 4, 6).

In 2010, the partnership of Shell (80%) and Petrobrás (20%) on the Bijupira and the Salema projects in Campos Basin also produced a combined 50,000 bbl/d of crude oil and more than 480,000 cubic meters per day of natural gas; the fields had resources of about 190 Mbbl of crude oil and 1.8 billion cubic meters of natural gas. Other companies involved in exploration in the pre-salt basins included Chevron, ExxonMobil, Repsol, Shell, and Statoil ASA of Norway (Empresa de Pesquisa Energética, 2011, p. 38–40; Petróleo Brasileiro S.A., 2011a).

Reserves and Resources

Brazil was among the world leaders in reserves of some mineral commodities (table 3). The country's world rankings for reserves of mineral commodities were as follows: first, niobium and tantalum; second, graphite; third, bauxite, tin, and zinc; fourth, magnesite and manganese; and fifth, iron ore (Departamento Nacional de Produção Mineral, 2011b).

Outlook

Brazil's mineral sector, which includes metals, industrial minerals, and fuels, continued to experience a phase of real growth in 2010. The main vehicles for the foreign direct investment (FDI) inflows in the short and medium terms are expected to be consortia, joint ventures, and acquisitions in new projects with Petrobrás, Vale, and others. Investments in biofuel, hydroelectric, nuclear, and thermoelectric powerplants are expected to meet Brazil's future energy needs. As an exporter of mineral commodities, the country is poised to gain from the continued FDI inflows into its economy, which represented an almost 57% share ($48.5 billion) of South America's total FDI of $85.1 billion in 2010. New mineral projects and expansions that were in progress are expected to ensure that Brazil retains its position among the global leaders in mineral commodity production in the foreseeable future. Brazil's renewed economic growth and its associated financial innovation are supporting an increase in the number of domestic and transnational investors in Brazil's mineral industry and, in particular, in the metals, natural gas and petroleum, and biofuels and ethanol industries

In 2010, Brazil had undergone dramatic changes in the crude oil and natural gas markets owing to the increase in energy investment opportunities, and Brazil had become the center of an increasingly rapid process of energy integration in South America. According to the Banco Central do Brasil and the Economic Commission for Latin America and the Caribbean, more than 400 leading TNCs were planning to invest in Brazil; these investments could position Brazil behind, in order of investment volume, China, the United States, and India. Brazil is expected to continue to be a strong economy in Latin America and the BRICS countries. As one of the world's leading producers of bauxite, crude oil, graphite, iron ore, manganese, niobium, tantalum, and tin, Brazil is expected to continue to attract additional FDI inflows in the near future (Azambuja, 2010, p. 27–40; Banco Central do Brasil, 2011a, p. 20; Economic Commission for Latin America and the Caribbean, 2011, p. 31; Petróleo Brasileiro S.A., 2011a).

Brazil's Federal tax exemptions on imports of equipment for minerals prospecting, exploration, development, and production are expected to continue in the medium and long terms. The ANP was planning to extend these exemptions for the fuels sector into 2020. Petroleum companies and other investors have shown confidence in the country, which could support continued economic growth and FDI in new technologies well into the next decade (Departamento Nacional de Produção Mineral, 2011b, c).

Brazil's gold production could increase significantly in the foreseeable future because of the growth of Brazil's copper production and increased interest by domestic and foreign investors in largely unexplored areas. More than 2,500 gold occurrences, which are mostly Precambrian vein deposits and alluvial placers, are known. According to IBRAM, the Brazilian mining sector would receive significant investments in the amount of $68.5 billion for the period 2011–15. In 2010, investment in mineral exploration, such as for, in order of economic value, bauxite, copper, iron ore, and nickel, amounted to $321 million (Instituto Brasileiro de Mineração, 2011a, b; Departamento Nacional de Produção Mineral, 2011b).

The Government eliminated all import tariffs and price controls on petroleum and derivatives to motivate private investment and to increase competition that would benefit the Brazilian economy. Petrobrás was expected to build additional refineries with the participation of new partners from the private sector (Departamento Nacional de Produção Mineral, 2011c; Petróleo Brasileiro S.A., 2011a).

The Amazon region contains considerable natural gas resources that remain nonproductive as yet, especially the Urucu field, which contains Brazil's largest onshore natural gas reserves. There is also the potential for major undiscovered mineral resources in addition to the large reserves of, in order of value, iron ore, manganese, bauxite, gold, and tin. There is, however, a concern over biodiversity in the Amazon Rainforest, which comprises 30% of the world's remaining tropical forests, and which provides shelter to 10% of the globe's plant and animal species and removes excess carbon dioxide from the atmosphere. Much of future minerals production, therefore, will also depend on the approaches and new technologies to be used for economic and social development that protects the environment in a responsible and sustainable way (Departamento Nacional de Produção Mineral, 2011b).

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TABLE 1

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010[p]
METALS						
Aluminum:						
Bauxite, dry basis, gross weight		22,836,000	25,460,700	28,097,500	28,060,000 [r]	31,700,000
Alumina		6,720,000	7,077,600	7,822,300	7,800,000 [r]	8,040,000
Metal:						
Primary		1,605,000	1,655,000	1,661,100	1,536,000 [r]	1,536,000
Secondary		253,000	255,000	256,000	250,000 [r]	252,000
Total		1,858,000	1,910,000	1,917,100	1,786,000 [r]	1,788,000
Cadmium, metal, primary[e]		200	200	200	200	200
Chromium:						
Crude ore		562,739	627,772	664,347 [r]	365,210 [r]	520,129
Concentrate and lump, Cr_2O_3 content		228,721	253,254	256,300	246,900	258,308
Marketable product[e, 3]		12,000	12,000	12,000	12,000	12,000
Cobalt:[e]						
Mine output, Co content of hydroxide		1,500	1,500	1,500	1,500	1,500
Metal, electrolytic[4, 5]		1,200	1,200	1,200	1,200	1,200
Copper:						
Mine output, Cu content		147,836	205,728	218,295 [r]	211,692 [r]	213,548
Metal, refined:						
Electrowon		-- [r]	900 [r]	3,800 [r]	6,500 [r]	7,400
Primary		179,700 [r]	178,380 [r]	191,008 [r]	193,899 [r]	177,800
Secondary[e]		40,000 [r]	40,000 [r]	39,000 [r]	31,000 [r]	47,700
Total		219,700 [r]	219,280 [r]	233,808 [r]	231,399 [r]	232,900
Gold:						
Mine output	kilograms	39,266	44,443 [r]	46,066 [r]	52,207 [r]	55,592
Garimpeiros, independent miners	do.	5,150	5,170 [r]	8,600 [r]	8,123 [r]	6,455
Total	do.	44,416	49,613 [r]	54,666 [r]	60,330 [r]	62,047
Iron and steel:						
Iron ore and concentrate, marketable product:[6]						
Gross weight	thousand metric tons	317,800	354,674	350,707 [r]	298,528 [r]	372,120
Fe content	do.	211,020	235,504	233,514	198,771 [r]	247,772
Metal:						
Pig iron	do.	32,452	35,571	35,000 [r]	35,000 [r]	32,000
Ferroalloys, electric arc furnace:						
Ferrochromium		166,577	195,890	199,324 [r]	131,048 [r]	277,114
Ferrochromium silicon		11,600 [e]	11,600 [e]	11,507	1,500	1,500
Ferromanganese		573,430 [r]	419,230 [r]	388,000 [r]	154,000 [r]	210,000
Ferronickel		9,814	9,918	7,136 [r]	9,427 [r]	8,465
Ferronobium		41,566	52,442	53,839	34,746 [r]	52,588
Ferrosilicon		146,000 [e]	146,000 [e]	144,832	145,000	145,000
Ferrosilicon magnesium[e]		14,600	14,600	14,560 [r]	14,500	14,500
Inoculant[e]		11,100	11,100	11,100	11,000	11,000
Silicomanganese		180,000 [e]	180,000 [e]	178,560	178,600	178,600
Silicon metal		133,000 [e]	133,000 [e]	131,940	132,000	132,000
Other ferroalloys		19,500 [e]	19,500 [e]	19,344	19,300	19,300
Total[e]		1,310,000 [r]	1,190,000 [r]	1,160,142 [r, 5]	831,121 [5]	1,050,067 [5]
Crude steel, excluding castings	thousand metric tons	30,900	34,782 [r]	33,700 [r]	26,500	33,033
Semimanufactures, flat and nonflat[e]	do.	17,500	17,500	17,500	17,500	17,500
Lead:						
Mine output, Pb content in concentrate		25,764	24,574	25,286 [r]	15,890 [r]	19,650
Metal, secondary		108,951	130,963	95,704	104,160 [r]	114,887
Manganese:						
Ore and concentrate, marketable:[3]						
Gross weight		3,390,000 [r]	1,570,000 [r]	3,200,000 [r]	2,320,000 [r]	2,620,000
Metal content		1,120,000 [r]	520,000 [r]	1,280,000 [r]	928,000 [r]	1,048,000
Metal:						
Primary		18,450	22,140	20,910	19,580	19,580
Secondary[e]		1,600	1,600	1,600	1,520	1,710

See footnotes at end of table.

TABLE 1—Continued
BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	2006	2007	2008	2009	2010[p]
METALS—Continued					
Nickel:					
Mine output, ore	5,503,211	5,927,554	6,380,055 [r]	4,333,069 [r]	11,128,385
Ni content in ore	82,492	58,317	67,116	41,059 [r]	108,983
Ni content in carbonate	21,630	20,796	18,580 [r]	16,766 [r]	30,161
Ni content in matte	5,416	3,401	8,328	8,518 [r]	14,308
Ni, electrolytic	21,339	21,635	18,530	16,598 [r]	19,111
Ferronickel, Ni content	9,814	9,918	7,136 [r]	9,427 [r]	8,465
Niobium (columbium)-tantalum ores and concentrates, gross weight:					
Columbite and tantalite[e]	456	456	456	456	456
Djalmaite concentrate[e]	10	10	10	10	10
Pyrochlore concentrate, Nb_2O_5 content	68,850	81,922	60,692 [r]	88,920 [r]	63,320
Silver:[7]					
Primary kilograms	30,000	36,000	35,500 [r]	35,000 [r]	36,500
Secondary do.	39,000	32,000	31,500 [r]	31,000 [r]	32,000
Total do.	69,000	68,000	67,000 [r]	66,000 [r]	68,500
Tin:					
Mine output, Sn content	9,528	11,835	13,899 [r]	9,500 [r]	10,400
Metal, smelter:					
Primary	8,780	9,384	11,020 [r]	8,311 [r]	9,098
Secondary[e]	250	250	250	250	250
Total	9,030	9,634	10,558	10,600	10,600
Titanium:					
Ilmenite:					
Gross weight	127,200	130,000	130,000	52,800 [r]	166,000
TiO_2 content	89,195	95,559	96,292 [r]	39,117 [r]	123,391
Rutile, TiO_2 content	2,100	3,000	2,309 [r]	2,737 [r]	2,519
Tungsten, mine output, W content	525	537	408 [r]	192 [r]	166
Zinc:					
Mine output, Zn content	185,211	193,887	173,933	172,688 [r]	211,203
Metal, smelter, primary	272,311	265,126	248,874	242,136 [r]	288,107
Zirconium, zircon concentrate, gross weight[8]	25,120	26,739	26,739	26,700	26,700
INDUSTRIAL MINERALS					
Asbestos:					
Crude ore	3,541,000	3,528,000	4,154,000	4,165,250 [r]	4,364,600
Fiber	227,304	254,204	287,673	288,452 [r]	302,257
Barite:					
Crude	47,611 [r]	22,869 [r]	241,179 [r]	196,860 [r]	198,161
Beneficiated	19,151	13,311	23,276 [r]	49,847 [r]	41,385
Marketable product[e, 3]	45,000	45,000	45,000	45,000	45,000
Calcite thousand metric tons	16,736 [r]	21,844 [r]	22,255 [r]	14,565 [r]	18,930
Cement, hydraulic do.	41,895 [r]	46,551	51,884 [r]	51,748	59,066
Clays:					
Bentonite, beneficiated	235,481	238,746	340,141 [r]	264,243 [r]	531,693
Kaolin:					
Crude	6,200,000	6,382,000	7,042,000 [r]	7,928,000 [r]	6,460,000
Beneficiated	2,455,000	2,530,000	2,456,000 [r]	1,987,000 [r]	2,200,000
Marketable product[3]	2,404,000	2,428,000	2,618,000	2,115,000	2,300,000
Diamond:[e]					
Gem and industrial:					
Private sector thousand carats	84	84	38 [r]	11 [r]	13
Garimpagem do.	97	98	33 [r]	10 [r]	12
Total[9] do.	181	182	71 [r]	21 [r]	25
Diatomite:					
Crude	10,753	9,638	12,126 [r]	7,534 [r]	9,264
Beneficiated	8,968	5,555	4,430 [r]	4,350 [r]	4,082
Marketable product[e, 3]	13,100	13,100	13,100	13,000 [r]	13,000

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010[p]
INDUSTRIAL MINERALS—Continued						
Feldspar:						
Crude		166,418 [5]	182,168 [5]	182,200 [5]	182,000 [e]	182,000
Marketable product:[3]						
Feldspar		71,785	166,089 [e]	166,100 [e]	166,000 [e]	166,000 [e]
Leucite[e]		5,000	5,000	5,000	5,000	5,000
Sodalite, crude[e]		500	500	500	500	500
Total		77,285	171,589	171,600	171,500	171,500
Fluorspar:						
Crude ore		192,628	198,449	191,600	192,000 [e]	192,000
Concentrates, marketable product:						
Acid-grade		41,373	45,342	45,032	28,803 [r]	7,486
Metallurgical-grade		22,231	20,582	18,209	15,161 [r]	18,328
Total		63,604	65,924	63,241	43,964 [r]	25,814
Graphite:						
Crude[e]		650,000	650,000	650,000	650,000	650,000
Marketable product, concentrate[3]		76,194	77,163 [r]	74,831 [r]	59,425 [r]	72,623
Gypsum and anhydrite, crude		1,711,671	1,923,119	2,238,645 [r]	2,348,390 [r]	2,750,000
Kyanite:[e]						
Crude		750	750	750	750	750
Marketable product[3]		600	600	600	600	600
Lime, hydrated and quicklime	thousand metric tons	7,057	7,393	7,400 [e]	7,400	7,400
Lithium, concentrates		8,950	8,950	14,460 [r]	15,929 [r]	15,733
Magnesite:						
Crude		1,163,422	1,301,827	1,475,814 [r]	1,234,041 [r]	1,535,052
Beneficiated		382,718	399,314	421,333 [r]	409,909 [r]	483,882
Mica, all grades[e]		4,000	4,000	4,000	4,000	4,000
Nitrogen, N content of ammonia[e]		950,000	950,000	950,000	950,000	950,000
Phosphate rock, including apatite:						
Crude:						
Mine product	thousand metric tons	36,700	38,265	39,243	42,000	42,000
Of which sold directly[e]	do.	35	35	35	35	35
Concentrate:						
Gross weight	do.	5,932	6,185	6,727 [r]	6,084 [r]	6,192
P_2O_5 content	do.	2,111	2,185	2,472 [r]	2,163 [r]	2,179
Pigment, mineral, other, crude[e]		2,000	2,000	2,000	2,000	2,000
Potash, marketable (K_2O)		403,080	423,897	383,257	452,698 [r]	417,990
Potassium (KCl)		635,200	636,500	575,480	716,630 [r]	661,690
Precious and semiprecious stones except diamond, crude and worked:[e]						
Agate		3,000	3,000	3,000	3,000	3,000
Amethyst		1,000	1,000	1,000	1,000	1,000
Aquamarine		20	20	20	20	20
Citrine		100	100	100	100	100
Emerald		90	90	90	90	90
Opal		500	500	500	500	500
Ruby	value	$10,000	$10,000	$10,000	$10,000	$10,000
Sapphire	do.	$15,000	$15,000	$15,000	$15,000	$15,000
Topaz		50	50	50	50	50
Tourmaline		80	80	80	80	80
Other		500	500	500	500	500
Quartz crystal, all grades		14,195	22,561	21,511 [r]	11,588 [r]	13,024
Rare-earth metals, monazite concentrate, gross weight		958	1,173	834 [r]	303 [r]	500
Salt:						
Marine	thousand metric tons	5,122	5,365	5,200 [r]	4,462 [r]	5,615
Rock	do.	1,622	1,621	1,528 [r]	1,443 [r]	1,415
Silica, silex[e]		1,600	1,600	1,600	1,600	1,600

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010[p]
INDUSTRIAL MINERALS—Continued						
Sodium compounds:[e]						
Caustic soda		1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Soda ash, manufactured (barilla)		200,000	200,000	200,000	200,000	200,000
Stone, sand and gravel:[e]						
Dimension stone:						
Marble, rough-cut	cubic meters	200,000	200,000	200,000	200,000	200,000
Of which sold directly		50,000	50,000	50,000	50,000	50,000
Crushed and broken stone:						
Basalt	cubic meters	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Calcareous shells		450,000	450,000	450,000	450,000	450,000
Dolomite	thousand metric tons	3,500	3,500	3,500	3,500	3,500
Gneiss	cubic meters	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
Granite	thousand cubic meters	60,000	60,000	60,000	60,000	60,000
Limestone	thousand metric tons	60,000	60,000	60,000	60,000	60,000
Quartz[10]		250,000	250,000	250,000	250,000	250,000
Quartzite:						
Crude		400,000	400,000	400,000	400,000	400,000
Processed		200,000	200,000	200,000	200,000	200,000
Sand, industrial		2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
Sulfur:						
Frasch		20,954	22,336	22,400	22,400	22,400
Byproduct:						
Metallurgy		297,539	321,707	321,750	321,800 [r]	321,800
Petroleum		117,203	135,623	135,650	135,700 [e]	135,700
Total		435,696	479,666	479,800	479,900 [e]	479,900
Talc and Pyrophyllite:						
Combined:						
Crude		389,471	401,204	513,433 [r]	577,935 [r]	655,436
Marketable product[e, 3]		2,000	2,000	2,000	2,000	2,000
Vermiculite:						
Concentrate		19,279	18,952	32,503 [r]	50,438 [r]	49,976
Marketable product[e, 3]		3,100	3,100	3,100	3,100	3,100
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous:						
Run-of-mine	thousand metric tons	13,200	13,600 [r]	13,210 [r]	13,578	13,600
Beneficiated/Marketable[3]	do.	5,528	6,133 [r]	6,723 [r]	5,818 [r]	6,310
Coke, metallurgical, all types	do.	7,493 [r]	8,315 [r]	8,286 [r]	7,259 [r]	9,189
Natural gas, gross	million cubic meters	17,706 [r]	18,152 [r]	21,593 [r]	21,142 [r]	22,938
Natural gas liquids	million 42-gallon barrels	10,196 [e]	10,767 [e]	10,365 [e]	9,673 [e]	9,570
Petroleum:						
Crude	thousand 42-gallon barrels	630,516 [r]	640,039 [r]	664,338 [r]	714,041 [r]	752,253
Refinery products:[11, 12]						
Liquefied petroleum gas (LPG)	do.	13,891	14,175	14,437 [r]	15,675	15,700
Gasoline	do.	142,703	145,673	148,365 [r]	161,091	161,100
Jet fuel	do.	592	605	621 [r]	670	700
Kerosene	do.	27,727	28,304	28,827 [r]	31,300	31,300
Distillate fuel oil	do.	219,228	223,580	227,709 [r]	247,241	247,200
Lubricants	do.	6,228	6,357	6,475 [r]	7,030	7,000
Residual fuel oil	do.	125,731	128,348	130,719 [r]	141,932	142,000
Other	do.	106,906	109,131	111,147 [r]	120,681	121,700
Total	do.	643,006	656,173	668,300 [r]	725,620	726,700

[e] Estimated; estimated data are rounded to no more than thee significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through December 31, 2011.

[2] In addition to the commodities listed, bismuth, molybdenite, and uranium oxide are produced, but output is not reported, and available information is inadequate to make reliable estimates of output.

[3] Direct sales and (or) beneficiated (marketable product).

[4] Source: Cobalt Development Institute.

[5] Reported figure.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

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[6] Includes sponge iron, in metric tons, as follows: 2006 to 2010—270,000 (estimated).

[7] Officially reported output. Of total production, the following quantities are identified as secondary silver (the balance being silver content of other ores and concentrates), in kilograms: 2006 and 2007, 50,000; 2008 through 2010, 45,000.

[8] Includes baddeleyite-caldasite.

[9] Figures represent officially reported diamond output plus official Brazilian estimates of output by nonreporting miners.

[10] Apparently includes crude quartz used to produce quartz crystal (listed separately in this table), as well as additional quantities of common quartz.

[11] Data are those officially reported to the United Nations by the Ministry of Mines and Energy of Brazil. Source: Energy Statistics Yearbook.

[12] Source: Economia Mineral do Brasil, Departamento Nacional de Produção Mineral, 2009 and 2010; and Petrobrás Annual Report 2009 and Petrobrás Magazine 2010.

TABLE 2
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS			
Aluminum	Albras-Alumínio Brasileiro S.A. (Albras) [Vale S.A., 51%, and Nippon Amazon Aluminio Co. (NAAC), 49%]	Belem and Vila do Conde, Para State (two smelters)	455 (metal).
Do.	Alcan Alumínio do Brasil S.A. [Alcan Aluminum Ltd. (Alcan), 100%]	Saramenha, Minas Gerais State (smelter and refinery)	100 (metal).
Do.	do.	do.	150 (alumina).
Do.	Alcan Empreendimentos Ltda. (Alcan Alumínio do Brasil S.A., 100%)	Lamininaçao de Pindamonhangaba, Sao Paulo State (smelter)	280 (metal).
Do.	Alcan Alumínio Poços de Caldas (Alucaldas) (Alcan Alumínio do Brasil S.A., 100%)	Poços de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	Alcoa Alumínio S.A. (Alcoa Inc., 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd., 10%)	do.	400 (bauxite).
Do.	do.	Sao Luiz, Maranhao State (refinery)	550 (alumina).
Do.	do.	Sao Luiz, Maranhao State (smelter)	239 (metal).
Do.	Alumínio do Brasil Nordeste S.A. (Alcan Aluminum Ltd., 100%)	Aratu, Bahia State (smelter)	120 (metal).
Do.	Alumar Consortium S.A. (Alcoa Alumínio S.A., 100%)	Juriti bauxite mine, Para State	4,000 (bauxite).
Do.	Alumar Consortium S.A. (Alcoa Inc., 54%; BHP Billiton plc, 36%; Alcan Aluminum Ltd., 10%)	Sao Luis, Maranhao State (refinery)	2,000 (alumina).
Do.	Alumar Consortium S.A. (Alcoa Inc., 53.66%, and BHP Billiton plc, 46.34%)	Sao Luis, Maranhao State (smelter)	1,000 (metal).
Do.	Alumínio do Norte do Brasil S.A. (Alunorte) (Vale S.A., 57%, and Hydro Aluminium, Nippon, Japan Alunorte, 43%)	Barcarena, Para State (refinery)	6,300 (alumina).
Do.	Companhia Brasileira de Alumínio (CBA) (Votorantim Group, 100%)	Poços de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	do.	Sorocaba, Sao Paulo State (refinery)	500 (alumina).
Do.	do.	Sorocaba, Sao Paulo State (smelter)	400 (metal).
Do.	Companhia Geral do Minas (Aluminum Co. of America, 79%, and others, 21%)	Poços de Caldas, Minas Gerais State (refinery)	275 (alumina).
Do.	do.	Poços de Caldas, Minas Gerais State (smelter)	95 (metal).
Do.	Mineração Rio do Norte S.A. (MRN) (Vale S.A., 40%; BHP Billiton plc, 14.8%; Alcoa Inc., 13.2%; Alcan Empreendimentos Ltda., 12%; Companhia Brasileira de Aluminio, Norsk Hydro Comercio e Industria, 5%; Reynolds Aluminio do Brasil, 5%)	Oriximina, Para State (mine)	18,000 (bauxite).
Do.	do.	Papagalo, Para State (mine)	2,000 (bauxite).
Do.	do.	Trombetas, Para State (mine)	2,000 (bauxite).
Do.	Vale do Sul Alumínio S.A. (Valesul) (Vale S.A., 100%)	Santa Cruz, Rio de Janeiro State (smelter)	95 (metal).
Do.	Reynolds Internacional do Brasil, 42.5%; Bradesco Bank, 42.5%; J.P. Morgan, 15%)	Sorocaba, Sao Paulo State (smelter)	5.4 million (cans).
Do.	Vale S.A., (private, 100%)	Paragominas, Para State (mine)	9,900 (bauxite).
Do.	do.	Jabuti, Para State (alumina)	1,860 (alumina).
Chromite	Coitezeirio Mineração S.A. (COMISA) (private, 75.4%, and Bayer do Brasil S.A., 24.6%)	Campo Formosa, Bahia State (mine)	50 (ore).
Do.	Companhia de Ferro Ligas da Bahia (FERBASA) (private, 100%)	do.	370 (ore).
Do.	do.	Campo Formoso, Bahia State (beneficiation plant)	292 (concentrate).
Copper	Vale S.A. (private, 100%)	Sossego Mine, Serra dos Carajas, Para State	130 (ore).
Do.	do.	Salobo Mine, Para State (copper concentrate and refinery plant)	520 (concentrate), 255 (metal).
Do.	Mineração Caraíba S/A (Grupo PARANAPANEMA, 100%)	Jaguari, Bahia State (mine)	130 (ore).
Do.	do.	Jaguari, Bahia State (beneficiation plant)	90 (concentrate).
Do.	Caraíba Metais S/A (CMSA) (Grupo PARANAPANEMA, 100%)	Camacari, Bahia State (refinery)	220 (metal).
Do.	Yamana Gold Inc. (YGI) (private, 100%)	Chapada, Alto Horizonte in Goias State (mine)	200 (concentrate).
Do.	Companhia Brasileira Carbureto de Calcio (private, 100%)	Santos Dumont, Minas Gerais State (plant)	54.

See footnotes at end of table.

TABLE 2—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS—Continued			
Ferroalloys	Prometal Produtos Metalúrgicos S.A., 60%, and Elkem A/S, 40%	Maraba, Para State (plant)	500.
Do.	Nova Era Silicon S.A. (Vale S.A., 49%; Mitsubishi Corp., 25.5%; Kawasaki Steel Corp., 25.5%)	Nova Era, Minas Gerais State	48.
Do.	Companhia Ferro-Ligas de Bahia S.A. (FERBASA), 100%	Pojuca, Bahia State (plant)	194.
Do.	Companhia Ferro-Ligas Minas Gerais (MINASLIGAS), 100%	Pirapora, Minas Gerais State (plant)	58.
Do.	Companhia Paulista de Ferro-Ligas (CPF) (private, 100%)	Barbacena, Caxambu, Jeceaba, Passa Quatro, and Passa Vinte, Minas Gerais State; Corumba, Matto Grosso do Sul State; and Xanxere, Santa Catarina State	326.
Do.	Italmagnesio S.A. Indústria e Comercio (ISAIC) (private, 100%)	Braganca Paulista, Sao Paulo State; and Varzeada Palma, Minas Gerais State (two plants)	63.
Do.	Rio Doce Manganês S.A. (Vale S.A., 100%)	Bahia, Mato Grosso do Sul, and Minas Gerais	600.
Do.	Urucum Mineração S.A. (Vale S.A., 100%)	Corumba plant, Mato Grosso do Sul State	20.
Gold kilograms	Vale S.A. (private, 100%)	Gold mines in the States of Minas Gerais, Bahia, and Para	18,000.
Do. do.	Mineração Morro Velho S.A. (AngloGold Ashanti Minerção Ltda., 100%)	Cuiaba, Novo Lima, and Sabara, Minas Gerais State; and Jacobina, Bahia State (four mines)	8,100.
Do. do.	Mineração Serra Grande S.A. (AngloGold Ashanti Mineração Ltda., 50%, and Kinross Gold Corp., 50%)	Serra Grande, Minas Gerais State (mine)	6,000.
Do. do.	São Bento Mineração S.A. (Eldorado Gold Corp., 100%)	Santa Barbara, Minas Gerais State (mine)	4,000.
Do. do.	Rio Paracatu Mineração S.A. (Kinross Gold Corp., 50%, and Mineração Serra Grande S.A., 50%)	Paracatu Mine, Minas Gerais State (mine)	7,500.
Do. do.	Yamana Gold Inc. (YGI) (private, 100%)	Chapada, Alto Horizonte in Goias State (mine)	1,200.
Do. do.	do.	Sao Francisco Mine, Mato Grosso State (mine)	3,100.
Do. do.	do.	Jacobina Mine, Bahia State (mine)	3,000.
Do. do.	do.	Fazenda Brasileiro, Goias State (mine)	3,700.
Do. do.	do.	Sao Vicente Mine, Mato Grosso State (mine)	1,900.
Iron ore	Companhia Siderúrgica Nacional (CSN) (private, 100%)	Volta Mine, Minas Gerais State	15,000.
Do.	Itaminas Comércio de Minérios S.A. (private, 100%)	Itaminas, Minas Gerais State	5,000.
Do.	Vale S.A. (private, 100%)	Serra dos Carajas Mine in Parauapebas, Para State	100,400.
Do.	do.	Itabirito, Mato, Vargem Grande, and Paraopeba, Minas Gerais State (four mines)	87,300.
Do.	do.	Itabira, Ouro Preto, Santa Barbara, Xavier, Tamandúa, Capao, and Mato, Minas Gerais State (seven mines)	134,600.
Do.	do.	Mato Grosso do Sul State (one mine)	1,500.
Do.	do.	Ponta Madeira, Sao Luis, and Tubarao, Maranhao State (pellet plants)	31,700.
Do.	Vale S.A. (Vale S.A., 50.9%, and Arcelor Mittal Co., 49.1%)	Hispanobras, Espirito Santo State (pellet plant)	3,800.
Do.	Vale S.A. (Vale S.A., 50%, and BHP Billiton plc, 50%)	Sepetiba, Samarco, Rio de Janeiro State (pellet plant)	21,800.
Do.	Ferteco Mineração S.A. (FERTECO) (Exploration Bergbau GmbH, 100%)	Ouro Preto and Brumadinho, Minas Gerais State (two mines)	12,800.
Do.	S.A. Mineração da Trindade (SAMITRI) (private, 100%)	Mariana, Rio Piracicaba, Itabira, Ouro Preto, and Sabara, Minas Gerais State (five mines)	9,300.
Do.	Minerações Brasileiras Reunidas S/A (MBR) (BHP Billiton plc, 50%, and Mitsui Co. Ltd., 50%)	Capao Xavier, Tamandua, and Capitao do Mato, Minas Gerais State (three mines)	32,000.
Do.	Samarco Mineração S.A. (SAMITRI), 51%, and BHP Billiton Ltd., 49%	Alegria, Minas Gerais State (mine)	15,000.
Do.	Mineração Corumbaense Reunida S/A (MCR) (Rio Tinto plc, 100%)	Corumba, Mato Grosso do Sul (mine)	2,000.
Lead	Companhia Mineira de Metais (CMM) (private, 100%)	Paracatu, Minas Gerais State (mine)	25 (ore).
Do.	do.	Paracatu, Minas Gerais State (plant)	15 (concentrate).

See footnotes at end of table.

TABLE 2—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS—Continued			
Manganese	Rio Doce Manganês S.A. (RDM) (Vale S.A., 100%)	Morro da Mina, Minas Gerais State	300.
Do.	do.	Mina do Azul, Carajas, Para State	2,500.
Do.	do.	Mina Mineiros, Bahia State	1,500.
Do.	Urucum Mineração S.A. (Vale S.A., 100%)	Corumba and Ladario, Mato Grosso do Sul State (two mines and plant)	1,500 (ore), 500 (concentrate).
Do.	Construtora Polares Ltda. (CPL) (private, 100%)	Corumba Minas Gerais State (mine)	200 (ore).
Nickel	Companhia Niquel Tocantins (Grupo Votarantim, 100%)	Niquelandia, Goias State (mine)	30 (ore).
Do.	do.	Niquelandia, Goias State (refinery plant)	25 (electrolytic).
Do.	Mineração Serra da Fortaleza (Grupo Votarantim, 100%)	Fortaleza, Minas Gerais State (mine)	19 (nickel matte).
Do.	CODEMIN S.A. (Anglo American plc, 100%)	Niquelandia, Goias State (refinery)	20 (metal).
Do.	Vale S.A. (private 100%)	Onca Puma and Vermelho, Para State (alloy plant)	58 (iron-nickel alloy).
Niobium (columbium)	Companhia Brasileira de Metalurgia e Mineração (Grupo Moreira Sales S.A., 55%, and Molycorp, Inc., 45%)	Araxa, Minas Gerais State (mine)	120 (ore).
Do.	do.	Araxa, Minas Gerais State (beneficiation plant)	60 (pyrochlore).
Do.	Mineração Catalão de Goiás Ltda. (MCGL) (Bozzano Simosen S.A., 68.5%, and Anglo American plc, 31.5%)	Ouvidor and Catalao I, Goias State (mines)	70 (ore).
Do.	do.	Ouvidor, Goias State (plants)	24 (pyrochlore).
Steel	Aço Minas Gerais S.A. (GERDAU AÇOMINAS, 100%)	Rodovia, Minas Gerais State	7,000.
Do.	Acesita S.A. (private, 100%)	Timoteo, Minas Gerais State (specialty steel)	900.
Do.	Companhia Siderúrgica Belgo-Mineira (private, 100%)	João Monlevade, Minas Gerais State	1,000.
Do.	Companhia Siderúrgica de Tubarão (private, 100%)	Serra, Espírito Santo State	4,800.
Do.	Companhia Siderúrgica Nacional (CSN) (private, 100%)	Volta Redonda, Rio de Janeiro State	5,800.
Do.	Companhia Siderúrgica Paulista (COSIPA) (private, 100%)	Cubatao, Sao Paulo State	4,500.
Do.	Usinas Siderúrgicas de Minas Gerais, S.A. (USIMINAS) (private, 100%)	Ipatinga, Minas Gerais State	5,500.
Tantalum metric tons	Mineração Taboca/AM (private, 100%)	Pitinga Mine, Amazonas State (mine)	180 (concentrate).
Do. do.	Companhia Industrial Fluminense S.A. (private, 100%)	Fluminense Mine, Minas Gerais State (mine)	25 (concentrate).
Tin	Mineração Jacunda Ltda. (MJL) (private, 100%)	Santa Barbara, Novo Mundo, and Potosi, Rondonia State (six mines)	108 (ore).
Do.	do.	Santa Barbara, Novo Mundo, and Potosi, Rondonia State (three beneficiation plants)	450 (concentrate).
Do.	Grupo PARANAPANEMA (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondonia State; Novo Aripuana, Pitinga, and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines and two plants)	5,420 (ore).
Do.	do.	Piraporada Bom Jesus, Sao Paulo State (refinery)	1,400 (concentrate), 25 (metal).
Do.	Marmoré S.A. (Grupo PARANAPANEMA, 100%)	Juiz de Fora, Minas Gerais State (mine)	20 (ore).
Do.	Grupo PARANAPANEMA (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondonia State; Novo Aripuana, Pitinga, and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines and two plants)	5,420 (ore).
Do.	do.	Piraporada Bom Jesus, Sao Paulo State (refinery)	1,400 (concentrate), 25 (metal).
Do.	Marmoré S.A. (Grupo PARANAPANEMA, 100%)	Juiz de Fora, Minas Gerais State (mine)	20 (ore).
Titanium	Rutilo e Ilmenita do Brasil S.A. (RIBSA), 100%	Mataraca, Paraiba State (mine)	4,200 (ore).
Do.	do.	Mataraca, Paraiba State (two beneficiation plants)	120 (concentrate).
Zinc	Votorantim Metais Zinco S/A (Grupo Votorantim, 100%)	Vazante, Minas Gerais State (mine)	800 (ore).
Do.	do.	Vazante, Minas Gerais State (beneficiation plant)	175 (concentrate).
Do.	do.	Tres Marias, Minas Gerais State (refinery)	180 (metal).
Do.	do.	Juiz de Fora, Minas Gerais State (complex)	130 (metal).
Zirconium	Nuclemon Minero-Química Ltda. (Government, 100%)	Sao Joao da Barra, Rio de Janeiro State (mine)	660 (ore).
Do.	do.	Itapemirim, Espirito Santo State (mine)	90 (ore).

See footnotes at end of table.

TABLE 2—Continued
BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
METALS—Continued			
Zirconium—Continued	Nuclemon Minero-Química Ltda. (Government, 100%)	Prado, Bahia State (mine)	90 (ore).
Do.	do.	Prado, Bahia State (three beneficiation plants)	123 (concentrate).
Do.	do.	Prado, Bahia State (three separation plants)	90 (concentrate).
INDUSTRIAL MINERALS			
Asbestos	Sociedade Anônima Mineração de Amianto (private, 100%)	Cana Brava and Minacu, Goias State (mines)	9,000 (ore).
Do.	do.	Cana Brava and Minacu, Goias State (beneficiation plant)	230 (concentrate).
Cement	Votorantim Cimentos S.A. (Grupo Votorantim, 100%)	Itapevi and Salto de Pirapora, Sao Paulo State	5,000 (3 plants).
Do.	do.	Itau de Minas, Minas Gerais State	5,000 (3 plants).
Do.	do.	Rio Branco do Sul, Parana State	5,000 (3 plants).
Do.	do.	Cipasa, Santa Elena, Sergipe State	5,000 (3 plants).
Do.	do.	Cantagalo, Esteio, Rio Grande do Sul State	5,000 (3 plants).
Do.	Companhia de Cimento Portland Paraiso (CCPP), 50%, and Lafarge S.A., 50%	States of Espirito Santo, Goias, Minas Gerais, and Rio de Janeiro (five plants)	4,000.
Do.	Companhia de Cimento Portland S.A. (CIMPOR Brazil)	States of Rio Grande do Sul, Santa Catarina, Sao Paulo, Goias, and Bahia (six plants)	6,000.
Do.	Camargo Correia Cimentos S.A. (CCSA) (private, 100%)	Ijaci, Minas Gerais State (plant)	1,600.
Do.	Holcim (Brasil) S.A.	Chacara, San Antonio, Sao Paulo State (four plants)	5,000.
Fluorspar	Mineração Nossa Senhora do Carmo Ltda. (private, 100%)	Cerro Azul, Parana State (two mines)	180 (ore).
Do.	Mineração Santa Catarina Ltda. (MSCL) (private, 100%)	Morro da Fumaça, Santa Rosa de Lima, Rio Fortuna, Santa Catarina State; and Tangua, Rio de Janeiro State (three mines and beneficiation plant)	100 (ore), 120 (concentrate).
Gemstones carats	Mineradora S/A (Diagem do Brasil Mineração Ltda., 100%)	Juina, Mato Grosso State	92,100.
Do. do.	Chapada Brasil Ltda. (Grupo Elkedra Diamonds NL, 100%)	Chapada dos Guimaraes, Mato Grosso State (mine)	100,000.
Do. do.	Mineração Rio Novo S/A. (private, 100%)	Diamantina, Minas Gerais State (mine)	107,500.
Graphite	Nacional de Grafite Ltda. (NGL) (private, 100%)	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three mines)	80 (ore).
Do.	do.	Itapecerica, Pedra Azul, Salto da Divisa, Minas Gerais State (three beneficiation plants)	60 (concentrate).
Do.	Grafita MG Ltda. (GML) (private, 100%)	Mateus Leme, Zerra Azul, Minas Gerais State (two mines)	20 (ore).
Do.	Marmoré Mineração e Metalurgia Ltda. (MML) (Grupo PARANAPANEMA, 100%)	Maiquinique, Bahia State (mine)	10 (ore).
Gypsum	Companhia Brasileira de Equipamento (private, 100%)	Codo, Maranhao State, and Ipubi, Pernambuco State (two mines)	600 (ore).
Do.	Mineradora Rancharia Ltd/Supergesso S.A (private, 100%)	Ipubi, Pernambuco State (mine)	600 (ore).
Do.	Holcin Brasil S.A. (Grupo Holderbank, 100%)	Holder, Pernambuco State (mine)	600 (ore).
Do.	Mineradora São Jorge S.A (Grupo Laudenor Lins, 100%)	Sao Jorge, Maranhao State (mine)	110 (ore).
Do.	Votorantin Cimentos N/NE (private, 100%)	Mateo, Ceara State (mine)	70 (ore).
Kaolin	Caulim da Amazônia S.A. (CADAM) (private, 100%)	Mazagao, Amapa State (mine)	720 (ore).
Do.	do.	Mazagao, Amapa State (beneficiation plant)	360 (concentrate).
Do.	do.	Adam Mine, Rio Jari, Amazonas State	660 (concentrate).
Do.	Pará Pigmentos S.A. (PPSA) (private, 100%)	Para Mine, Para State	500 (concentrate).
Do.	Ymerys Rio Capim Caulim S.A. (RCCSA) (private, 100%)	Rio Capim Mine, Para State	500 (concentrate).
Do.	Empresa de Mineração Horii Ltda. (EMHL) (private, 100%)	Biritiba and Mogi das Cruzes, Sao Paulo State (two mines)	200 (ore).
Do.	do.	Biritiba and Mogi das Cruzes, Sao Paulo State (two beneficiation plants)	180 (concentrate).

See footnotes at end of table.

TABLE 2—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
INDUSTRIAL MINERALS—Continued			
Limestone	Companhia de Cimento Portland Paraiso (CCPP) (private, 100%)	States of Goias, Minas Gerais, and Rio de Janeiro (five mines)	2,000.
Do.	Companhia de Cimento Portland Rio Branco (CCPRB), 100%	Rio Branco do Sul, Parana State (three mines)	5,500.
Do.	S.A. Industrias Votorantim (SAIV) (private, 100%)	States of Rio de Janeiro and Sao Paulo (four mines)	1,000.
Magnesite	Magnesita S.A. (MSA) (private, 100%)	Brumado, Bahia State (one major mine and numerous small mines)	1,000 (ore).
Do.	do.	Brumado, Bahia State (two beneficiation plants)	280 (concentrate).
Phosphate rock	Bunge Fertililizantes S.A. (Bunge Ltd., 100%)	Araxa, Minas Gerais State (mine)	5,000.
Do.	Copebrás S.A.(Copebrás) (Anglo American plc, 100%)	Ouvidor, Goias State (mine)	4,400.
Do.	Fosfértil S.A. (Grupo Fertifós, 81.54%; Vale S.A., 10.96%; public, 7.5%)	Tapira, Minas Gerais State (two mines)	10,500.
Do.	Ultrafértil S.A. (Grupo Fertifós, 81.54%; Vale S.A., 10.96%; public, 7.5%)	Araxa, Minas Gerais State (mine)	5,000.
Quartz	Telequartzo Exportação S.A. (TESA) (private, 100%)	Cristal, Minas Gerais State (mine)	6.0.
Salt, rock	Frota Oceânica Brasileira S.A. (FOBSA) (private, 100%)	Jacupiranga, Sao Paulo State (mine)	6,000.
Do.	Dow Química do Nordeste Ltd. (DQNL) (Dow Chemical Co., 100%)	Vera Cruz, Bahia State (mine)	1,000.
Do.	Cia. Nacional de Alcalis S.A. (CNA) (private, 100%)	Alcalis Grupo, Rio Grande do Norte State	1,500.
Do.	Salgema Mineração e Química S.A. (SMQ) (private, 100%)	Salgema, Maceio, Alagoas State (mine)	1,000.
MINERAL FUELS AND RELATED MATERIALS			
Coal	Carbonífera Circiúma S.A. (CCSA) (private, 100%)	Circiuma and Sideropolis, Santa Catarina State (two mines)	1,600.
Do.	Companhia Carbonífera Metropolitana S.A. (private, 100%)	Circiuma, Sideropolis, and Urussanga, Santa Catarina State (three mines)	1,200.
Do.	Copelmi Mineração Ltda. (COPELMI) (private, 100%)	Arroio dos Ratos, Butia, and Charqueadas, Rio Grande do Sul State (four mines)	4,600.
Do.	Indústria Carbonífera Rio Deserto Ltda. (private, 100%)	Circiuma and Urussanga, Santa Catarina State (two mines)	2,600.
Natural Gas thousand cubic meters	Petróleo Brasileiro S.A. (Petrobrás) (Government, 81.4%; private, 11.8%; public, 6.8%)	Fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro	20,000.
Petroleum thousand 42-gallon barrels	do.	Fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro, Rio Grande do Norte, Para, Maranhao, and Sergipe	700,000.
Petroleum products do.	do.	Refineries in the States of Amazonas, Bahia, Ceara, Minas Gerais, Parana, Rio de Janeiro, Rio Grande do Sul, and Sao Paulo	650,000.
Do. do.	Refinaria de Petróleo Ipiranga S.A. (private, 100%)	Ipiranga, Rio Grande do Sul	3,400.
Do. do.	Refinaria de Petróleos de Manguinhos S.A. (private, 100%)	Manquinhos, Rio de Janeiro State	3,650.

Do., do. Ditto

TABLE 3

BRAZIL: RESERVES OF MAJOR MINERAL COMMODITIES IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Asbestos, fiber		11,261
Bauxite		2,600,000
Chromite, Cr_2O_3		2,170
Coal, all types		2,482,000 [2]
Cobalt	metric tons	89,000
Copper, metal content		9,800
Fluorspar (CaF_2 content)		1,000
Gold, metal content	metric tons	2,600
Graphite		59,500
Gypsum		228,411
Iron ore		20,359,000
Kaolin		7,300,000
Lead, metal content	metric tons	86,000
Lithium	do.	46,000
Magnesite		298,626
Manganese, metal content		60,000
Natural gas	million cubic meters	423,003 [2]
Nickel, metal content		7,532
Niobium (columbium) (pyrochlore and columbite ore)		4,097
Petroleum, crude	million 42-gallon barrels	14,247 [2]
Phosphate rock		273,000
Rare earths	metric tons	31,000
Talc and pyrophyllite		227,000
Tantalum	metric tons	88,782
Tin, metal content		712
Titanium minerals, TiO_2 content		1,670
Uranium, U_3O_8	metric tons	309,000 [3]
Vanadium	do.	175,000
Vermiculite		9,500
Zinc, metal content		2,600
Zirconium		4,053

[1] Source: Summário Mineral 2010–11.

[2] Sources: Empresa de Pesquisa Energética—Balanço Enegético Nacional 2011; Petróleo Brasileiro, S.A., Petrobrás Magazine 2010–11; U.S.Energy Information Administration, Brazil—Overview/Data, October 2010–11 (Available at http://www.eia.gov/countries/country-data.cfm?fips=BR).

[3] Source: Instituto Brasileiro de Mineração, 2011.

THE MINERAL INDUSTRY OF CANADA

By Philip M. Mobbs

Canada is a nation rich in mineral resources. In 2010, Canada's mineral industry continued its recovery from the global financial crisis of 2008–9. As one of the major mining countries in the world, Canada leads the world in the production of potash (by volume). The country was estimated to rank second in the production of uranium and was among the top five countries in the production of aluminum, cobalt ore, gem-quality diamond, refined indium, nickel ore, platinum-group metals (PGM) ore, and sulfur (Apodaca, 2011; Bray, 2011; Jasinski, 2011; Kuck, 2011; Loferski, 2011; Olson, 2011; Tolcin, 2011; World Nuclear Association, 2011).

Minerals in the National Economy

Minerals were produced in all 10 Provinces and 3 Territories of Canada. Natural gas and oil production and coal and refined petroleum products were valued at about $41.5 billion in 2010. The value of production from mining, primary metal manufacturing, and nonmetal manufacturing increased by 21% to $36 billion[1] (Statistics Canada, 2011b, c).

In 2010, the construction industry accounted for 6.1% of Canada's real gross domestic product (GDP); the extraction of natural gas and petroleum, 3.2%; and mining and quarrying, about 0.6%. Within the mining industry, the extraction of nonmetallic minerals accounted for 0.34% of real GDP in 2010; metallic minerals, 0.26%, and coal, 0.07%. Other mineral-related sectors that contributed to real GDP included primary metal manufacturing, 1.8%, and petroleum and coal products manufacturing, 0.26% (Statistics Canada, 2011b, c).

Government Policies and Programs

In general, Provincial governments are responsible for mining activity within their respective Province. Provincial legislatures make laws concerning matters for which they have jurisdiction, which include exploration, development, production, and conservation and management of most nonrenewable natural resources. Parliament makes laws for the entire country with respect to matters assigned to it by the Canadian Constitution, and it has responsibility for the Territories. The Federal Government is responsible for the mineral activities of Federal Crown corporations; mineral activities on Federal lands and offshore; and, through the Canadian Nuclear Safety Commission, for uranium exploration, production, and waste disposal. Local or municipal governments promulgate laws on local matters, such as zoning regulations and the issuance of construction permits.

The Canadian Securities Administrators' National Instrument 43–101 sets the standards for all technical public disclosure for mineral projects. National Instrument 51–101 sets the standards for disclosure for oil and gas activities.

Saskatchewan enacted a diamond royalty system in 2010. The scheme includes a 1% royalty on the value of mine production, which begins 5 years after initial production; a stepped royalty rate (up to 10%) on profits after capital investment is fully recovered; a 100% depreciation rate of capital costs; and a processing allowance (Government of Saskatchewan, 2010).

A significant number of international mineral exploration companies were based in Canada. Canadian companies owned mining assets that were valued at about $106 billion in 123 countries. In 2010, the proposed Corporate Accountability of Mining, Oil and Gas Corporations in Developing Countries Act (Bill C-300) was defeated in the House of Commons. Bill C-300, which would have required the Minister of Foreign Affairs and the Minister of International Trade to issue corporate accountability guidelines in the areas of environmental best practices and international human rights, had been debated since 2009 (Natural Resources Canada, 2011a).

Production

Although the volume of production increased notably for a number of mineral commodities in 2010, the volume surpassed the high levels of production in 2008 for only a few of those commodities. Output of potash increased by almost 127% in 2010 compared with that of 2009; talc, by 118%; refined petrochemical feedstock, by 70%; crude steel, by about 41%; refined silver, by 27%; lime, by 19%; nickel ore, by 17%; cobalt ore and iron ore, by almost 17%; alumina, by almost 16%; cement and nepheline syenite, by 13%; and peat, by about 12%. Production of antimony, barite, direct-reduced iron, indium, pig iron, and titanium was estimated to have increased significantly also (table 1).

Despite the mineral industry's ongoing recovery from the global financial crisis, a significant decrease in the mineral production volume in 2010 compared with that of 2009 was noted for tungsten, which decreased by about 79%; gemstones, 55%; selenium, 54%; kerosene and tellurium, about 50%; salt, 28%; gypsum, 23%; cadmium and cobalt metal, 13% each; and PGM, about 10%. Asbestos production also was estimated to have decreased (table 1).

Structure of the Mineral Industry

Canada was one of the world's most active mining countries and it had numerous mineral exploration, mine development, and mining projects underway. Canadian companies that explored in other countries accounted for a significant percentage of the world's solid mineral exploration budgets. In addition, the Metals Economics Group estimated that exploration for solid minerals in Canada accounted for about

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[1] Where necessary, values have been converted from Canadian dollars (CAN$) to U.S. dollars (US$) at an average rate of CAN$1.03=US$1.00 for 2010 and CAN$1.14=US$1.00 for 2009.

19% of the nonhydrocarbon exploration budget of the world's mining companies. Table 2 lists the structure of the Canadian mineral industry by principal mineral commodities and major operating companies (Metals Economics Group, 2011, p. 5).

A number of new mines were opened in 2010. Ursa Major Minerals Inc. began operations at the Shakespeare nickel mine. In April, Xstrata Nickel, which was a division of Xstrata plc of Switzerland, commissioned the Nickel Rim South Mine, which is located in the Sudbury area, and ramped up production to the mine's full nameplate capacity of 1.25 million metric tons per year (Mt/yr) by October. Xstrata Nickel also restarted production from the Fraser Morgan Mine complex at Sudbury; the mine had been placed on care-and-maintenance status in 2009 owing to the significant decrease in world nickel prices (Xstrata plc, 2011, p. 1, 7).

In February, Barkerville Gold Mines Ltd. (formerly known as International Wayside Gold Mines Ltd.) acquired the QR gold mine and mill from 0373849 B.C. Ltd. (formerly Cross Lake Minerals Ltd.), which had suspended mining at QR in early 2009 during the company's reorganization. By September, Barkerville had restarted production from a newly developed area of the property (International Wayside Gold Mines Ltd., 2009; Barkerville Gold Mines Ltd., 2010).

Century Mining Corp. resumed mining and milling operations at the Lamaque gold mine. HudBay Minerals Inc. restarted operations at the Chisel North zinc mine and the Snow Lake concentrator, which had been suspended in January 2009 owing to low metal prices. North American Palladium resumed underground mining of the Roby Zone at the Lac des Iles palladium mine, which had been placed on care-and-maintenance status in 2008. North American Tungsten Corporation Ltd. reopened the CanTung Mine, which had been placed on care-and-maintenance status in October 2009 owing in part to a decrease in international tungsten prices. Western Coal Corp. restarted mining at the Willow Creek coal mine, where operations had temporarily been suspended in 2008 owing to the global economic crisis (HudBay Minerals Inc., 2009; North American Tungsten Corporation Ltd., 2009a).

In October 2010, Crowflight Minerals Inc. temporarily suspended operations at the Bucko Lake nickel mine (at which commercial ore production began in 2009) in order to replace the underground mining contractor, Dumas Contracting Ltd. Operations at the mine, which is located near Wabowden, Manitoba, remained suspended at yearend. In 2009, Goldcorp Inc. ceased mining operations at the Pamour open pit, which was part of the Porcupine Mine. In 2010, parts of the pit ramps were mined, and previously stockpiled ore was hauled to the Dome mill. The Pamour stockpile was expected to be depleted in 2011 (Crowflight Minerals Inc., 2010; First Metals Inc., undated).

At Sudbury, Ontario, Vale Canada Ltd., which was a subsidiary of Vale S.A. of Brazil, continued with the development of the Totten nickel mine and the redevelopment of the Ellen nickel mine. As part of the restructuring of Xstrata Copper Canada, which was a subsidiary of Xstrata plc, the copper and zinc metallurgical plants at the Kidd Creek facility in Timmins, Ontario, were closed in May (Xstrata plc, 2010, p. 5, 7).

Several companies changed their names during the year. BHP Billiton Diamonds Inc., which was a subsidiary of BHP Billiton Ltd. of Australia, changed its name to BHP Billiton Canada Inc. Merit Mining Corp. became Huakan International Mining Inc., and Vale Inco Ltd. changed its name to Vale Canada Ltd.

In 2010, as the global economic crisis waned and the price of minerals increased, merger and acquisition activity in the Canadian minerals industry increased. Apollo Gold Corp. and Linear Gold Corp. merged in June to form Brigus Gold Corp. Axens S.A. of France, which was a subsidiary of IFP Energies Nouvelles of France, acquired the Brockville activated alumina refinery from Rio Tinto Alcan and established Axens Canada Specialty Aluminas Inc. to operate the plant. In March, BHP Billiton Canada acquired Athabasca Potash Inc. and its Burr potash project.

Cliffs Natural Resources Inc. secured 100% interest in the Wabash Mines iron ore operation after it acquired a 44.6% interest from its former joint-venture partner ArcelorMittal Dofasco Inc. and a 28.6% interest from former partner U.S. Steel Canada. Cliffs also acquired Freewest Resources Canada Inc. Freewest had been developing the chromite resources of the McFaulds property.

FNX Mining Corp. merged with Quadra Mining Ltd. to form Quadra FNX Mining Ltd. Gerdau Steel North America Inc. acquired 100% of the shares of Gerdau Ameristeel. Jien Canada Mining Ltd., which was a partnership of Jilin Jien Nickel Industry Company, Ltd. of China (75% equity interest) and Goldbrook Ventures Inc. of Canada (25%), acquired Canadian Royalties Inc.

Kodiak Exploration Ltd. acquired Golden Goose Resources Inc., and the combined organization subsequently was renamed Prodigy Gold Inc. KNOC Canada Ltd., which was a subsidiary of Korea National Oil Corp., acquired Harvest Energy Trust, which produced hydrocarbons and operated a petroleum refinery. Harvest Energy and KNOC Canada subsequently were combined to form Harvest Operations Corp.

OneSteel Ltd. of Australia acquired AltaSteel Ltd. from Anglo American plc. Anglo's Skaw Metals Group previously had managed AltaSteel. Prophecy Resource Corp. acquired Northern Platinum Ltd. Stillwater Mining Co. of the United States acquired Marathon PGM Corp. and Thompson Creek Metals Company Inc. acquired Terrane Metals Corp., which was developing the Mt. Milligan copper-gold project.

In the oil sands sector, Athabasca Oil Sands Corp. acquired Excelsior Energy Ltd. and Excelsior's interest in the Hangingstone oil sands property. In addition, Sinopec International Petroleum Exploration and Production Co. of China acquired ConocoPhillips Co. of the United States' 9.03% interest in Syncrude Canada Ltd., which produced crude oil from oil sands, and Total S.A. of France acquired UTS Energy Corp. and UTS' interests in oil sands projects.

Apache Canada Ltd. acquired most of BP p.l.c. of the United Kingdom's natural gas exploration and production operations in western Alberta and British Columbia. Purchased assets included the Chinchaga, the Edson, the Fox Creek, the Noel, and the St. Lina natural gas operations, the Cadomin and the Doig prospects, and the Mist Mountain coalbed methane project.

Mineral Trade

In 2010, Canada's total domestic exports amounted to about $393 billion compared with $324 billion in 2009. Exports of crude petroleum were valued at about $49 billion compared with $37 billion in 2009, and exports of natural gas were valued at $15 billion compared with about $14 billion in 2009. Exports of metals and metal ores were valued at about $13 billion in 2010 compared with $9 billion in 2009, and those of metals and alloys were valued at $35 billion compared with about $25 billion in 2009 (Statistics Canada, 2011a).

Canada's total domestic imports amounted to about $402 billion in 2010 compared with $328 billion in 2009. Imports of metals and metal ores were valued at $32 billion in 2010 compared with about $22 billion in 2009, and imports of crude petroleum were valued at $23 billion in 2010 compared with $18 billion in 2009 (Statistics Canada, 2011d).

Commodity Review

Mineral exploration activity increased in 2010 compared with that of 2009, as did the rate of mineral prospect development and mining activity. For many projects, however, only the minimal exploration activity necessary for claim maintenance was conducted. Coverage of other Canadian mineral commodities is available on the Web site for Natural Resources Canada's Canadian Minerals Yearbook at http://www.nrcan.gc.ca/minerals-metals/business-market/canadian-minerals-yearbook/4070.

Metals

Aluminum.—Production of primary aluminum slightly decreased again in 2010 to 2.96 million metric tons (Mt) compared with 3.03 Mt in 2009 and 3.12 Mt in 2008 (Paquette, 2010, 2011).

Rio Tinto plc (2011, p. 43) reported record output in 2010 at the Arvida smelter (a 1.8% increase compared with that of 2009) and the Grand-Baie smelter (a 1.4% increase). Overall, the company posted a 3% decrease in aluminum production in 2010 (to 2.3 Mt, which was about 78% of Canada's aluminum production) compared with that of 2009. Production from the Kitimat smelter in British Columbia decreased by about 40,000 metric tons (t) in 2010 compared with that of 2009. The almost 18% decrease was attributed in part to the closure of potlines 7 and 8, which used Soderberg technology, as part of the ongoing Kitimat modernization project. Production from the Laterriere smelter in Quebec decreased by about 23,000 t compared with 2009 output. The almost 10% decrease was the result of a July power outage, which caused the temporary suspension of one-half of the plant's production capacity until a potline restart procedure was completed in September (Rio Tinto Alcan Inc., 2010a; Rio Tinto plc, 2011, p. 43, 80).

Rio Tinto Alcan also upgraded the pilot plant project at Saguenay, Quebec, to AP60 technology from the originally proposed AP50 configuration. The 38-pot pilot plant, which was designed with a production capacity of 60,000 metric tons per year (t/yr) of aluminum, was expected to be operational in 2013 (Rio Tinto Alcan Inc., 2010b, 2011).

Antimony.—In Canada, antimony was produced at the Beaver Brook Mine, which is located in Newfoundland and Labrador. Antimony was also recovered as a coproduct from the output of several base-metal mines in Canada and as an antimony-lead alloy that was produced from recycled lead-acid batteries.

The Beaver Brook underground antimony mine had been developed by Roycefield Resources Ltd. in mid-1997 but was placed on care-and-maintenance status in 1998 because of low international antimony prices. Beaver Brook Antimony Mine Inc. (BBAMI) subsequently acquired the facility and, in 2008, reopened the mine, which produced about 550 metric tons per day (t/d) of ore. The mill operated four days per week. In October 2009, Hunan Nonferrous Metals Corp. of China acquired BBAMI and proposed to increase the mine and mill's output. Exploration for additional resources near the mine was ongoing (McCutcheon, 2002; Stadnyk, 2009; Connelly, 2010).

In fiscal year 2009–10, the lease for the Lake George antimony mine, which is located in New Brunswick, was not renewed. Apocan Inc. had operated the mine from 1972 until 1989, when low antimony prices resulted in the suspension of operations. Apocan reopened the mine in late 1996, but mechanical problems and low international antimony prices again resulted in the suspension of operations. The mine subsequently flooded. In 2010, Apocan and the New Brunswick Department of Natural Resources continued discussions on the covering and reclamation of the tailings pile (McCutcheon, 1996, 2002; Department of Natural Resources, 2010, p. 52–53).

Other exploration activity for antimony included that of Mountain Lake Resources Inc., which completed a 10-hole 600-meter (m) drill program on the Little River antimony-gold prospect in Newfoundland (Mountain Lake Resources Inc., 2010), and the work on the Bald Hill antimony-gold property in New Brunswick where Rockport Mining Corp. completed a resource estimate in 2010 based on a 2008 drilling program. Portage Mineral Inc. acquired the property in 2010 when its subsidiary company 7600062 Canada Ltd. merged with Rockport.

Indium and Tin.—In the past few years, Teck Resources Ltd. had restored the indium metal production capacity at the Trail smelter and refinery complex in British Columbia to about 70 t/yr. Most of the ore treated at the Trail complex was imported from overseas mines of Teck Resources and others. In May, Xstrata plc permanently closed the Kidd Creek metallurgical complex in Ontario, which in the past few years had produced between 8 and 11.5 t/yr of indium metal. In Quebec, General Smelting Company of Canada (which was a division of Xstrata Zinc) produced tin alloys at its plant near Montreal (Allfantazi and Moskalyk, 2003, p. 689; Xstrata Copper Canada, 2009, p. 16; 2010, p. 15; Xstrata plc, 2011, p. 5).

A number of exploration projects for indium and tin were underway. In 2010, Adex Mining Inc. completed a 26-hole 3,734-m diamond drill program on the North Zone of the Mount Pleasant Mine property. The company evaluated the options for the production of a tin concentrate and an indium-zinc concentrate, versus the production of indium sponge metal, tin concentrate, and zinc metal from North Zone ore (Adex Mining Inc., 2010a, b; 2011a, b).

Avalon Rare Metals Inc. suspended a preliminary economic analysis (also called a scoping study) of the East Kemptville tin-indium project in order to complete an NI 43-101-compliant sampling and drill program to evaluate the tin resources of the prospect, which is located in Nova Scotia. On the Ikes Ridge property, which is located adjacent to the East Kempville Special License, Avalon completed a soil sampling program, a surface geophysics program, and a 12-hole 2,219-m drill program in 2010 (Avalon Rare Metals Inc., 2010a).

Molybdenum.—The joint venture of Thompson Creek Metals Company Inc. and Sojitz Moly Resources, Inc. operated the Endako Mine, which is located in British Columbia. Ore was mined from the Denak East, the Denak West, and the Endako pits and milled to recover a molybdenum disulfide concentrate, which was then roasted and converted to molybdenum trioxide. In 2010, drill programs included an exploration program northwest of the Denak West pit and reserve-definition infill drilling. Also in 2010, Sojitz approved the restarted Endako mill expansion program, which included the construction of a 55,000-t/d-capacity mill to replace the existing 31,000-t/d-capacity mill. The mill expansion had begun in 2008 but was suspended in December 2008 owing to the global economic crisis. Annual molybdenum production capacity was expected to be increased to about 7,200 t/yr by 2012 (Thompson Creek Metals Company Ltd., 2011, p. 34–35; undated).

Highland Valley Copper Mine, which is located in British Columbia, was operated by Teck Resources Ltd. In 2010, Highland Valley Copper's molybdenum production was about 3,100 t, which was about a 5% increase compared with that of 2009. The increase was attributed to higher molybdenum content of the ore, which was mined from the Highmont, the Lornex, and the Valley pits. A mine expansion project, which included the extension of the Highmont and the Lornex pits and the push back and stabilization of the east and west walls of the Valley pit, continued in 2010. The Valley pit's east wall stabilization project was scheduled to be completed in 2011. Teck expected that, following the completion of the expansion project, the mine life would be extended to 2025 at planned extraction rates (Teck Resources Ltd., 2010, p. 11–12; 2011, p. 11–12).

In 2010, the Gibraltar copper-molybdenum mine, which was operated by Gibraltar Mines Ltd., produced about 427 t of molybdenum, which was an almost 50% increase in molybdenum output compared with that of 2009 (Taseko Mines Ltd., 2011b). The mine, which is located in British Columbia, had been closed by the previous owner in 1998 owing to low metal prices. Gibraltar Mines, which was a subsidiary of Taseko Mines Ltd., acquired the operation in 1999 and resumed production in 2005. An initial expansion of the Gibraltar mill to 46,000-t/d capacity was completed in February 2008. Work on the planned phase 2 expansion of the mill to 55,000 t/d, which was delayed in 2008 owing to the global economic crisis, resumed in 2009 and was expected to be completed in 2011. In March, a consortium of Japanese companies, which included Sojitz Corp. (50% interest in the consortium) and Dowa Metals & Mining Company, Ltd. and Furukawa Company, Ltd. (25% each), acquired 25% equity interest in the Gibraltar copper mine for approximately $182 million (Taseko Mines Ltd., 2010a, p. 17–19; 2010b).

In 2010, FortyTwo Metals Inc., which was a subsidiary of Roca Mines Inc., was authorized to increase production at the underground Max molybdenum mine to 1,000 t/d, which would double the average daily output achieved during the period January through July 2010. Operations at the mine and mill, which were located in British Columbia, had reached commercial production levels in April 2008. In September, however, FortyTwo Metals temporarily suspended operations at the Max Mine after the collapse of a sill pillar. Rehabilitation work was begun, redevelopment plans were discussed with Provincial authorities, and, by yearend, the mine's ventilation system had been restored (Roca Mines Inc., 2010a, p. 5–6; 2010b; 2011).

Huckleberry Mines Ltd., which was a subsidiary of Imperial Metals Corp., completed an exploration drilling program of the resources around and below the Main Zone of the Huckleberry Mine. The company started a feasibility study of mining the resource below the Main Zone. Imperial Metals completed a 13-hole 3,548-m drill program on the Catface copper-molybdenum property (Imperial Metals Corp., 2010a, p. 5; 2010b, p. 3–4).

The Province of British Columbia hosted most of Canada's molybdenum exploration activity. In 2010, exploration of the High Gold copper-molybdenum property by Argonaut Exploration Inc. included a 9-hole 2,542-m drill program. Avanti Mining Inc. completed a feasibility study of the reopening of the Kitsault Mine. The Kitsault Mine had operated from 1968 to 1972 and from 1981 until 1982; low molybdenum prices had resulted in the mine closures. New production was expected to begin about 2 years after reconstruction commences. Avanti also entered into an agreement under which Molibdenos y Metales S.A. of Chile would toll refine molybdenum concentrate produced at Kitsault. In December, Avanti announced that it planned to form a strategic alliance with SeAH Holdings Corp. of the Republic of Korea, which was to acquire about 11% of Avanti's shares and up to 30% interest in the Kitsault project (Argonaut Exploration Inc., 2011, p. 5–6; Avanti Mining Inc., 2010a–c).

Bard Ventures Ltd. drilled and began a preliminary economic assessment of the Alaskite zone of the Lone Pine molybdenum prospect. Callinan Mines Ltd. reported some molybdenum mineralization from drill core samples on the Coles Creek property and surface samples from the Troitsa property. Columbia Yukon Explorations Inc. drilled the Storie molybdenum prospect, and Copper Fox Metals Inc. began a feasibility study of a proposed 120,000-t/d-capacity mine at the Schaft Creek copper-molybdenum prospect. Copper Fox expected to complete an environmental assessment, the feasibility study, and a resource estimate of the project in 2011 (Callinan Mines Ltd., 2010; Copper Fox Metals Inc., 2011).

Finlay Minerals Ltd. completed a 6-hole 2,036-m diamond drill program on the Silver Hope copper-molybdenum-silver prospect, and Getty Copper Inc. amended a prefeasibility study of the Getty copper-molybdenum property. Happy Creek Mineral Ltd. explored the Fox tungsten-molybdenum property in British Columbia. Hi Ho Silver Resources Inc. sampled soil on the Carmi property and withdrew from an option to acquire 51% of the South Rim property from St. Elias Mines Ltd., but

Inform Resources Corp. (formerly Downtown Industries Ltd.) subsequently entered an option to acquire 75% of the South Rim property. Hi Ho Silver also abandoned its option to acquire the Silver Tip property (Finlay Minerals Ltd., 2010; Hi Ho Silver Resources Inc., 2010a; 2010b, p. 2–3; St. Elias Mines Ltd., 2010, p. 9; 2011, p. 3).

Kiska Metals Corp. explored the Falcon prospect on the Redton project and Kingsman Resources Inc. completed a 7-hole 1,066-m diamond drill program at the Luxor molybdenum prospect. Kobex Minerals Inc. withdrew from the Island Copper project (on which the Hushamu deposit was drilled in 2009 by IMA Exploration Inc., prior to that company's merger with International Barytex Resources Ltd. and Kobex Resources Ltd. to form Kobex Minerals) (Kingsman Resources Inc., 2010; Kobex Minerals Inc., 2010).

Lions Gate Metals Inc. explored the Poplar prospect. In 2011, Lions Gate proposed to drill the Popular and the Hudson Bay Mountain molybdenum prospects in British Columbia. Adjacent to the Highland Valley copper mine, Logan Copper Inc. (formerly known as SNL Enterprises Ltd.) completed a 5-hole 1,230-m diamond drill program on the Dansey and Midway sectors of the Logan Copper property (Logan Copper Inc., 2010).

Also in British Columbia, Pretium Resources Inc. completed a 17,976-m diamond drilling program and a preliminary assessment on the Snowfield property. The assessment estimated that an average of about 1,700 t/yr of molybdenum and 9 t/yr of rhenium in concentrate could be recovered as byproducts from the projected Snowfield copper-gold operation if a proposed 120,000-t/d-capacity mill was used to process ore from the Brucejack gold and Snowfield polymetallic properties. On the Kerr-Sulphurets-Mitchell (KSM) copper-gold-molybdenum-silver project, which was adjacent to the Snowfield property, Seabridge Gold Inc. completed a 30,000-m drill program and a prefeasiblity study. The study estimated that an average of about 950 t/yr of molybdenum in concentrate could be recovered from the operation if a proposed 120,000-t/d-capacity milling operation was used. At yearend, an updated prefeasibility study that incorporated the new drilling data was underway (Seabridge Gold Inc., 2010a, p. 1; 2010b, p. 1–21; Wardrop Engineering Inc., 2010, p. 1-8, 1-16).

St. Elias Mines explored the South Rim project. Serengeti Resources Inc. reported some molybdenum mineralization in samples from a 28-hole 7,600-m drill program on the Kwanika property. Touchdown Resources Inc. (formerly Touchdown Capital Inc.) reported the results from a 2-hole 617-m diamond drill program on the Sphinx molybdenum project. As part of a prefeasibility study, TTM Resources Inc. released a resource estimate on the Chu property. TTM also explored the Deeker Creek prospect (Serengeti Resources Inc., 2010; Touchdown Capital Inc., 2010).

Velocity Minerals Ltd. completed a 3-hole 1,398-m drill program on the Cassiar Moly property in British Columbia and reported the results of sampling a 4-hole 783-m drill program, which was completed in 2009, on the Mt. Haskin property. In 2010, Western Copper Corp. completed a 46-hole 12,046-m delineation and infill drill program and continued work on updating a prefeasibility study (that originally was completed in 2008) on the Casino copper-gold-molybdenum property in British Columbia (Giroux and Casselman, 2010, p. 37; Velocity Minerals Ltd., 2010a, b).

Molybdenum exploration activity also took place in Ontario. It included that of Golden Phoenix Minerals Inc., which began exploration of the Northern Champion property; Inspiration Mining Corp., which explored the Desrosiers property; MPH Ventures Corp., which was updating the resource estimate for the Pidgeon molybdenum deposit; and Shoreham Resources Ltd., which explored the Bearhead Trend, Setting Net Lake, and Twinpeaka properties.

Activity in other Provinces included that of Adex Mining, which in 2010 evaluated its options to produce ammonium molybdate from molybdenum-tungsten ore from the Fire Tower zone of the Mount Pleasant Mine property in New Brunswick. Western Troy Capital Resources Inc. authorized the resumption of work on a feasibility study of the MacLeod Lake copper-molybdenum prospect in Quebec. Western Troy had suspended work on the study in 2009 because of the effects that it anticipated that low metal prices and uncertain energy costs would have on the study's projections. Agnico-Eagle Mines Ltd. completed a 27-hole 18,723-m diamond drill program on the Jennings Project in Yukon Territory (Western Troy Capital Resources Inc., 2009; Yukon Geological Survey, 2011, p. 56).

Nickel.—Production and maintenance employees at Sudbury, Ontario, and Port Colborne, Ontario, ratified a new union contact in July, which ended their strike that began in July 2009. The strike of unionized workers at the Ovoid Mine at Voisey's Bay, Newfoundland and Labrador, which began in August 2009, was resolved on January 31, 2011. The return of production workers at Sudbury at mid-year (and the use of contractors and nonunion workers during the strikes) allowed Vale Canada (formerly Vale Inco) to increase the company's Canadian nickel output by about 2% in 2010 compared with that of 2009. At Sudbury, Vale reopened the Ellen Mine and continued the development of the Totten Mine, which is expected to reach commercial production level in 2011. Vale Inco had suspended operations at the Ellen Mine in 2008 owing to low nickel prices. Inco Ltd. had started work on the Totten Mine in 1966 but, because of low nickel prices, had suspended development of the mine in 1972 (Tollinsky, 2009; French, 2010; Rocha, 2010; Vale S.A., 2011, p. 16, 35–38).

In November, Vale announced that it planned to close the Thompson nickel smelter and refinery by 2015. The Thompson plant processed nickel concentrates from the Manitoba division (reportedly about 55% of plant input) and from Voisey's Bay (about 45% of plant input). Owing to the planned 2013 startup of the Long Harbour processing plant on the island of Newfoundland, which would process Voisey's Bay concentrates, and the scheduled implementation of new Federal sulfur dioxide emission standards in 2015, Vale proposed to mine and mill ore only in Manitoba (Vale Canada Ltd., 2010).

The Nickel Rim South Mine was commissioned in April and reached full production capacity of 1.25 Mt/yr of ore (about 18,000 t/yr of nickel) in October. Mining operations at the Frasier Mine, which was placed on care-and-maintenance status in 2009, were resumed in 2010. Xstrata plc reported that ore production from the Sudbury division increased by 69% (Xstrata plc, 2011, p. 1, 7).

Operations at Crowflight Minerals' Bucko Lake nickel mine were suspended in October 2010 and remained suspended at yearend. Ursa Major Minerals started production from the Shakespeare Mine in the Sudbury area; output was processed at Xstrata plc's Strathcona mill.

Niobium and Tantalum.—In 2010, the niobium content of ferroniobium production from the Niobec facility in Quebec increased to 4,419 t compared with 4,169 t in 2009. IAMGOLD Corp. attributed the increase to the expansion of the facility's concentrator's ore-processing capacity to 2.2 Mt/yr. IAMGOLD also reported that the Niobec Mine's niobium reserves were increased to about 244,000 t of Nb_2O_5 contained in ore. At the Niobec facility, IAMGOLD converted the mine's pyrochlore concentrate (58% Nb_2O_5) to ferroniobium. In 2010, no Canadian tantalum production was reported. Tantalum Mining Corp. of Canada Ltd. (Tanco) suspended tantalum mining at the Bernic Lake Mine in 2009 owing to the lack of demand for the commodity that was associated with the global economic crisis (Cabot Corp., 2010, p. 6; Natural Resources Canada, 2010; 2011c; IAMGOLD Corp., 2011, p. 5, 13; undated).

Exploration for niobium and tantalum included that of Commerce Resources Corp., which completed a 54-hole 12,949-m diamond drill program on the Upper Fir deposit. A preliminary economic assessment of the Upper Fir, which was part of the Blue River niobium-tantalum project that was located in British Columbia, was underway (Commerce Resources Corp., 2011, p. 2–4).

In January, MDN Inc. reported that a positive scoping study on the Anita niobium and tantalum property, which also was known as the Crevier property, was completed for Les Minéraux Crevier Inc. (MCI), which was a joint venture of MDN and IAMGOLD. The property is located in Quebec. MCI subsequently completed an 8-hole 1,063-m drill program as part of a feasibility study of the Anita prospect (MDN Inc., 2010, 2011).

In 2010, Taseko Mines Ltd. completed a 23-hole 4,460-m diamond drill program on the Aley niobium project. Taseko Mines acquired the property in 2006, but in 2008 and 2009 had postponed planned exploration owing to the global financial crisis (Taseko Mines Ltd., 2011a).

In 2010, much of the early-stage niobium and tantalum exploration activity was associated with exploration for rare-earth elements. In British Columbia, American Manganese Inc. (formerly Rocher Deboule Minerals Corp.) reported niobium mineralization in rock and soil samples acquired from the Lonnie and Virgil carbonatites (also known as the Brent property). Rara Terra Capital Corp. subsequently secured an option to acquire 60% interest in the Lonnie property. The joint venture of Canadian International Minerals Inc. and Commerce Resources Corp. completed a 9-hole 1,939-m diamond drill program on the Carbo rare-earths project. Sample results also indicate niobium mineralization on the property. International Bethlehem Mining Corp. reported niobium and tantalum mineralization in addition to rare earths in a sample taken from the Myoff Creek property in British Columbia (American Manganese Inc., 2010; Canadian International Minerals Inc., 2010, undated; International Bethlehem Mining Corp., 2010).

Rare Earth Metals Inc. reported niobium mineralization in core recovered from an 18-hole 5,432-m drill program on the Clay-Howells property, which is located in Ontario, and from core recovered from drill programs on the Red Wine property, which is located in Newfoundland and Labrador. Canadian Orebodies Inc. reported tantalum mineralization in samples taken from the Zigzag property, which was located in Ontario. In March, Canadian Orebodies agreed to earn 80% in the Zigzag lithium-tantalum property from Ultra Lithium Inc., which had acquired the property in August 2009. PhosCan Chemical Corp. continued to evaluate the potential to recover niobium from the phosphate plant tailings from the proposed Martison phosphate mining operation, which is also located in Ontario (Canadian Orebodies Inc., 2010a–c; PhosCan Chemical Corp., 2010; Rare Earth Metals Inc., 2010, p. 3–4).

In the Province of Quebec, Fieldex Exploration Inc. reported niobium mineralization in samples from the Delbreuil rare-earths–uranium property (which also was known as the Temiscamingue regional project). In 2010, a planned drilling was postponed, pending additional community outreach efforts concerning the uranium occurrence. Globex Mining Enterprises Inc. explored the Turner Falls rare-earths property. Niobium mineralization was reported in the surface samples gathered at Turner Falls, and Matamec Explorations Inc. reported the presence of niobium in samples taken from the Surprise showing on the Zeus rare-earths property. A preliminary economic assessment was completed for Quest Rare Minerals Ltd. (formerly Quest Uranium Corp.) on development of the B-zone of the Strange Lake rare-earths property. The assessment anticipated that the project would produce rare-earth oxide, niobium oxide, and zirconium oxide concentrates, and forecast that about 25% of the project's income during the life of the mine would come from the estimated value of the niobium in concentrate output (Fieldex Exploration Inc., 2010a; 2010b, p. 2; Matamec Explorations Inc., 2010; Quest Rare Minerals Ltd., 2010, p. 7; Globex Mining Enterprises Inc., 2011).

In the Northwest Territories, Avalon Rare Metals Inc. released a positive prefeasibility study of the Nechalacho rare-earth elements deposit at the Thor Lake rare-metals project. Recovery of four separate concentrates, including a rare-earth oxide, a niobium oxide, a tantalum oxide, and a zirconium oxide, was evaluated as part of the study. Avalon subsequently started work on a feasibility study. Avalon completed a 63-hole 16,188-m resource-definition drilling program in 2010, and in 2011, planned to drill an additional 29,000 m to collect 30 t of ore for additional metallurgical tests (Avalon Rare Metals Inc., 2010b, p. 4–7; 2011).

Under an option obtained from True North Gems Inc., Great Western Minerals Group Ltd. continued exploration of the True Blue property in Yukon Territory, on which True North reported niobium mineralization in samples from the property. In late 2010, Great Western decided to cease exploration activity on the property (True North Gems Inc., 2009; Great Western Minerals Group Ltd., 2011, p. 6).

Tungsten.—In October, North American Tungsten Corporation Ltd. reopened the CanTung Mine, which had been placed on care-and-maintenance status in October 2009. The company cited increased demand for tungsten and rising prices for tungsten as the impetus to resume operations. North American Tungsten also announced an increase in reserves to

1.69 Mt of ore at an average grade of 1.17% tungsten trioxide (WO_3) compared with estimated reserves of 1.02 Mt of ore at a grade of 1.08% WO_3 that was reported in 2009 (North American Tungsten Corporation Ltd., 2009b, 2010).

In British Columbia, Dentonia Resources Ltd. acquired surface samples and interpreted a magnetic survey that was flown across the Stafford tungsten project (formerly known as the Knight Inlet prospect). Freeport Resources Inc. completed an airborne geophysical survey of the Red Rose gold prospect, which included the former Red Rose tungsten mine that was closed in 1954 in response to decreased demand for tungsten. The Red Rose Mine also had produced copper, gold, and silver. In 2009, Sultan Minerals Inc. completed a 6-hole drill program and released an updated tungsten resource estimate for the Jersey-Emerald tungsten property. Sultan subsequently focused its attention on the adjacent HB lead-zinc property (which was acquired in 2010) on which the former Garnet and HB zinc mines are located. An 8-hole 545-m drill program to test for lead and zinc mineralization on the HB property was completed in 2010. Drill core samples also were tested for tungsten and other elements (Sultan Minerals Inc., 2009a, b; 2010, p. 2, 5; Freeport Resources Inc., 2010, p. 7).

In New Brunswick, a scoping study of the Mount Pleasant Mine property's Fire Tower zone, which was completed for Adex Mining in 2008, suggested that ammonium paratungstate could be produced from the molybdenum-tungsten ore. The former Mount Pleasant tungsten mine, which is located on the property and which produced tungsten concentrate, was closed in 1985 because of low tungsten prices. Cadillac Ventures Inc. mapped, sampled, and prospected on the Burnt Hill tungsten joint-venture prospect. Mineralization on the Burnt Hill joint venture with Noront Resources Inc. also included molybdenum and tin. Geodex Mineral Ltd. was exploring several tungsten prospects; many of the prospects also had indium, molybdenum, tin, and zinc mineralization. In 2010, Geodex reported the results of a 6-hole 610-m drill program on the Flume Ridge tungsten property and a 4-hole 450-m drill program on the Nashwaak tungsten property (Adex Mining Inc., 2010a; undated; Geodex Mineral Ltd., 2010c).

In December 2009, after more than 2 years of funding exploration on the Mount Pleasant West properties in New Brunswick, Teck Resources Ltd. withdrew from its option to acquire the properties. In 2010, Geodex reanalyzed selected core and surface samples from Mount Pleasant West, which resulted in the announcement of the presence of beryllium, gold, and rare-earth values in the samples. In 2010, Northcliff Resources Ltd., which was associated with Hunter Dickinson Inc., acquired 70% interest in the Sisson Brook (also known as the Sisson) tungsten project. By yearend, Northcliff started a 4,000-m drill program as part of a feasibility study that was expected to be completed by 2012. The property also contained molybdenum mineralization (Geodex Mineral Ltd., 2009; 2010a, b; 2011).

In 2008, Tyhee Development Corp. released a resource estimate of the Nicholas Lake Main zone of the Yellowknife gold project, which was located in the Northwest Territories, which indicated that the deposit also contained tungsten. In 2010, however, Tyhee released a prefeasibility study of the Yellowknife project that indicated that the company anticipated no credit would be received from the gold refinery for the minor tungsten content of Yellowknife dore (Tyhee Development Corp., 2008; 2010, p. 151).

In Yukon Territory, Largo Resources Ltd. started a preliminary economic assessment of the Northern Dancer tungsten-molybdenum project (also known as the Logtung property) in 2010. Largo optioned the property in 2006 from Strategic Metals Ltd., which retained 30% interest in the property. Playfair Mining Ltd. continued exploration of the Clea, the Lened, and the Risby properties. In 2010, Prospector Consolidated Resources Inc. announced that it had terminated the option to acquire the Kalzas tungsten property from Copper Ridge Explorations Inc. owing to alleged discrepancies in Copper Ridge's rights to the property. Prospector had explored the property since 2007 (Prospector Consolidated Resources Inc., 2010).

Between 2006 and 2008, StrataGold Corp. drilled and sampled the Mar-Tungsten zone of the Dublin Gulch gold property in Yukon Territory. In 2009, Victoria Gold Corp. acquired StrataGold and subsequently focused on the development of the Eagle Gold heap-leach project on the Dublin Gulch property. The Mar-Tungsten zone was renamed the Wolf tungsten deposit.

In 2008, Yankee Hat expanded its exploration focus from the Fran gold mine to tungsten exploration in the Yukon Territory. It secured an option to acquire the WAU tungsten property from ATAC Resources Ltd. in April and an option to acquire the Boot, the Hidden, the Meloy, the Obvious, and the Track tungsten properties from Strategic Metals Ltd. in June; it acquired the Selwyn properties with joint-venture partner Japan Oil, Gas, and Metals National Corp. (JOGMEC) in July. In August 2008, Yankee Hat announced that it had entered into a joint exploration agreement to explore for tungsten in southeastern Yukon Territory and in the Northwest Territories with JOGMEC. Subsequently, Yankee Hat also entered into options to acquire the Achtung tungsten property, which is located in British Columbia, and the Birdtung tungsten-tin property (Yankee Hat Minerals Ltd., 2008, 2009b).

By October 2008, the Yankee Hat-JOGMEC joint venture had discovered and explored the Kidlark tungsten project, but, by late 2008, the global economic crisis had begun to affect the demand for (and the price of) tungsten, which in turn affected the availability of funding for mineral exploration and property acquisitions. In April 2009, to fulfill its commitment to tungsten project generation, Yankee Hat announced its intention to spin off its interest in its principal property (the Fran gold prospect) to Eagle Hill Exploration Corp. Eagle Hill subsequently withdrew from the negotiations for the Fran property. By midyear 2009, Yankee Hat decided not to complete the acquisition of the WAU property from ATAC. The acquisition of the Strategic Metals Ltd. tungsten properties was terminated and written off the books, and Yankee Hat also withdrew from the agreements to acquire the Achtung and the Birdtung properties (Eagle Hill Exploration Corp., 2009; Yankee Hat Minerals Ltd., 2009a, p. 10, 12; 2009b; Shedd, 2011).

In September 2010, Yankee Hat announced the renegotiation of its tungsten agreement with JOGMEC, which would allow Yankee Hat to focus on exploration of the Fran gold property.

The company's joint-venture agreement with JOGMEC subsequently was terminated and JOGMEC transferred its 75% interest in the Kidlark and the Selwyn properties to Yankee Hat. JOGMEC retained an option to reacquire 75% interest in the properties for $1 for each property plus an amount equal to twice that Yankee Hat may spend on exploration of the properties during the option period, which would end in August 2014 (Eagle Hill Exploration Corp., 2009; Yankee Hat Minerals Ltd., 2009b; 2010a, p. 4–5; 2010b).

Industrial Minerals

Diamond.—The preliminary estimate of Canada's diamond production in 2010 was 11,773,000 carats, which was a 7.6% increase from the 10,946,000 carats produced in 2009. The value of produced diamond in 2010 rebounded to about $2.3 billion compared with $1.5 billion in 2009 (Natural Resources Canada, 2011c).

The Ekati Mine, which is located in the Northwest Territories, recovered diamond from several kimberlites. Production operations at each individual surface pit or underground mine were relatively short lived, although BHP Billiton Canada expected to produce from the Ekati Mine until at least 2018. Production from the Beartooth pit ended in 2009 and from the underground Panda operation in 2010. Mining continued at the Koala underground mine and at the Fox open pit, and started at the Koala North underground mine. In 2010, BHP Billiton Canada evaluated the Misery Deep project, which would resume operations at the Misery pit (which produced from 2001 until 2005) and evaluated options for surface mining at the Pigeon project. In 2010, diamond production from the Ekati Mine decreased by about 15% compared with that of 2009. The Ekati Mine accounted for about 39% of Canada's diamond production and 3% of the world's diamond production in 2009, which was the latest year for which world data were available (BHP Billiton Canada Inc., 2010a, p. 5; 2010b, p. 4–5; Kimberley Process Certification Scheme, 2010).

The joint venture of Diavik Diamond Mines Inc., which was a subsidiary of Rio Tinto plc (60% interest) and Harry Winston Diamond Limited Partnership (40%), increased output to 6.5 million carats, which was about a 17% increase compared with 2009 production but about a 30% decrease from that of 2008. Diamond output from the Diavik Mine had been reduced in 2009 owing to the global economic crisis. In March 2010, production began from underground mining operations that accessed the A154 North kimberlite pipe, the A154 South pipe, and the A418 pipe. Open pit operations, which were expected to be depleted by 2012, continued at the A154 South pipe and the A418 pipe. Diavik projected that the underground mining operations would continue until 2022 (Rio Tinto plc, 2011, p. 52, 81).

At the Snap Lake underground and the Victor open pit mines, De Beers Canada Inc. increased diamond recovery by 54% in 2010 compared with that of 2009 when production had been curtailed. Diamond output from the Snap Lake Mine, which is located in the Northwest Territories, increased by about 109% to 926,000 carats, and at the Victor Mine, which is located in Ontario, by about 19% to 826,000 carats. In late 2009, De Beers announced that it planned to increase annual production at Snap Lake to 1.6 million carats from a projected 1.4 million carats in 2012. Exploration continued at the Delta and the Tango Extension pipes in the 16-pipe Victor kimberlite cluster (De Beers Group, 2010, p. 17; 2011, p. 28; De Beers Canada Inc., undated).

Production operations at the Jericho diamond mine, which is located in Nunavut Territory, were suspended in early 2008 owing to Tahera Diamond Corp.'s financial problems. The Department of Indian and Northern Affairs Canada had sustained the mine's care-and-maintenance status since December 2008. To facilitate the sale of the Jericho Mine, Tahera and its subsidiary Benachee Resources Inc. commissioned a new preliminary economic assessment of the mine, which was completed in January 2010. In July, Shear Diamonds Corp., which was a subsidiary of Shear Minerals Ltd., received approval from the Ontario Superior Court of Justice to purchase the Jericho Mine, associated processing facilities, and various exploration assets from Benachee and Tahera. By yearend, Shear Minerals changed its name to Shear Diamond Ltd. (Tahera Diamond Corp., 2008a–c; 2010).

Early-stage diamond exploration was underway at numerous sites in Alberta, British Columbia, Northwest Territories, Nunavut Territory, Ontario, Quebec, and Saskatchewan. Advanced Canadian diamond projects included the Gahcho Kué project, which was located in the Northwest Territories, where a feasibility study was completed for the joint venture of De Beers Canada and Mountain Province Diamonds Inc. A scoping study was prepared for the Renard project, which was located on the Foxtrot property in Quebec. The Renard project was being explored by a joint venture of Diaquem Inc., which was a subsidiary of SOQUEM Inc., and Les Diamants Stornoway Inc., which was a subsidiary of Stornoway Diamond Corp. In December, Stornoway proposed to acquire Diaquem's 50% interest in the Renard project. In Saskatchewan, a prefeasibility study was completed for the Star-Orion South diamond project, and a final feasibility study was expected to be completed in 2011. Shore Gold Inc. held 100% interest in the Star project and 66% interest in the Fort à la Corne joint venture (FALC–JV), which contained the Orion South and the Star West kimberlites. Newmont Mining Corporation of Canada Ltd. held the other 34% in the FALC–JV.

Fluorspar.—In 2010, Canada Fluorspar Inc. continued a feasibility study, metallurgical tests, and a pilot plant evaluation of the St. Lawrence fluorspar project in Newfoundland and Labrador. A 2009 technical report estimated that the project's Blue Beach vein contained about 4.4 Mt of ore with an average grade of 39% calcium fluoride (CaF_2). The Tarefare and Blowout veins contained 4.7 Mt of ore with an average grade of 44.8% CaF_2. The area had been mined for fluorspar by American Newfoundland Fluorspar Ltd. from 1936 to 1942; by Alcan Smelters and Chemicals Ltd. from 1942 until 1978, when operations ceased owing to the availability of higher quality, lower priced fluorspar from overseas; and by St. Lawrence Fluorspar Ltd. from 1986 until 1990, when the company ceased mining and milling operations owing to the low international fluorspar prices and funding difficulties (Pearse, 1979; Agnerian, 2009, p. 1-2, 1-6).

Canada Fluorspar's feasibility study and testing for the St. Lawrence fluorspar project was expected to be completed in 2011. Pending receipt of the appropriate licenses and permits, Canada Fluorspar projected that construction of new facilities, the proposed capacity expansion of the project's mill in order to produce between 120,000 t/yr and 180,000 t/yr of fluorspar concentrate, and the rehabilitation of the mine would all start in late 2011 (Canada Fluorspar Inc., 2011, undated).

Lithium.—In 2009, Tanco suspended production of lithium (spodumene) at the Bernic Lake Mine. The mine, which also was known as the Tanco Mine, is located in Manitoba.

In 2010, positive prefeasibility and feasibility studies were completed on the Quebec Lithium Project, which is located in Quebec, for Canada Lithium Corp. Construction of an open pit mine with the capacity to produce 1 Mt/yr of ore was scheduled to begin in 2011. Initial production was planned to start in late 2012, subject to financing and permitting. At full production (by 2013), the processing plant was expected to produce about 20,000 t/yr of battery-grade lithium carbonate. The project's measured and indicated mineral resources were estimated to be 46.7 Mt of ore at a grade of 1.19% lithium dioxide (Canada Lithium Corp., 2010).

A number of exploration programs for lithium were underway in Canada. Nemaska Exploration Inc. drilled and trenched the Whabouchi deposit. Mineral resources for the deposit, which is located in Quebec, were estimated to be 9.7 Mt of ore at a grade of 1.63% dilithium oxide (Li_2O). At yearend, a scoping study of the project was underway (Nemaska Exploration Inc., 2011).

In Ontario, Consolidated Abaddon Resources Inc. completed a 7-hole 1,464-m diamond drilling program at the Raleigh Lake lithium property. In early January 2011, Consolidated Abaddon changed its name to Aben Resources Ltd. In 2010, Linear Metals Corp. reported the results of a 19-hole 2,362-m drill program that was completed in 2009 on the Seymour Lake project but did not undertake any other work on the property (Consolidated Abaddon Resources Inc., 2010; Linear Metals Corp., 2010).

In February, Petro Horizon Energy Corp. acquired an option to earn up to 75% interest in the Brazil Lake property from Champlain Mineral Ventures Ltd. Petro Horizon subsequently changed its name to Greenlight Resources Inc. and completed a 28-hole 2,592-m diamond drill program at Brazil Lake, which is located in Nova Scotia (Greenlight Resources Corp., 2011).

In Quebec, First Gold Exploration Inc. completed a 143-hole 17,500-m drill program on the Lac Pivert-Rose property (formerly the Eastmain lithium property) that was started in December 2009. Resources on the Rose deposit were estimated to be 11.4 Mt of ore at a grade of 1.34% Li_2O. The ore also contained 0.03% beryllium oxide and 0.02% tantalum pentoxide. First Gold secured 100% interest in the property in 2010 and planned to begin a prefeasibility study in 2011. Jourdan Resources Inc. sampled the Pivert-Stairs property, which was adjacent to First Gold's Lac Pivert-Rose property (First Gold Exploration Inc., 2010a, b).

Also in Quebec, Glen Eagle Resources Inc. acquired the Authier property and completed a short drilling program. In May, Globestar Mining Corp. completed a 99-hole 13,379-m diamond drill program on the Moblan property. In December, Perilya Canada Ltd. acquired Globestar. Lithium One Inc. (formerly known as Coniagas Resources Ltd.) completed an 84-hole 12,380-m drill program at the James Bay lithium project in 2009 and in 2010 reported that the prospect's mineral resources were estimated to be 11.74 Mt of ore at a grade of 1.3% Li_2O. In December, Lithium One and Galaxy Resources Ltd. of Australia signed an agreement under which Galaxy could earn 70% interest in the James Bay project (Globestar Mining Corp., 2010, p. 9–10; Lithium One Inc., 2010; undated).

Channel Resources Ltd. continued tests on the recovery of boron, bromine, lithium chloride, and potash from brines produced by natural gas wells near Fox Creek, Alberta. Gas producers reinjected the waste brines into subsurface reservoirs; revenue from minerals recovered from the brines would reduce gas producer's brine disposal costs (Channel Resources Ltd., 2010).

Early stage exploration in Ontario included work by Canadian Orebodies, which reported lithium mineralization in samples taken from Tebishogeshik showing on the Zigzag lithium-tantalum property. A short drill program was planned for early 2011. In March, Fieldex Exploration Inc. entered into an option to acquire 60% interest in the property from Mantis Mineral Corp., which had secured an option to acquire the property in October 2009. Fieldex subsequently resampled core from the Case pegmatite that had been recovered during a 2001 drill program by Platinova A/S. Cricket Resources Inc. secured an option to acquire 60% interest in the Forgan Lake property from joint-venture partners International Lithium Corp. (ILC) and ILC's parent organization, TNR Gold Corp. In 2010, Cricket sampled the property (Canadian Orebodies Inc., 2010c).

In 2010, North Arrow Minerals Inc. reexamined samples collected in 2009 from the McAvoy pegmatite on its Torp Lake project, which is located in Nunavut Territory. Also in 2010, the Federal Court of Canada invalidated the Phoenix lithium project's land use permit that had been issued to North Arrow by the Mackenzie Valley Land and Water Board. The Phoenix project is located in the Northwest Territories (North Arrow Minerals Inc., 2010).

AKA Ventures Inc. ceased exploration activity on the Quebec Lithium project (Vallee claims) in 2010 owing to suboptimal exploration results and the failure to attract a joint-venture partner. The claims were located near Canada Lithium Corp.'s Quebec Lithium project. In Ontario, Avalon Rare Metals Inc. limited activity in 2010 on the Separation Rapids lithium-tantalum project's Big Whopper petalite deposit to market development for the potential lithium product, property cleanup and maintenance, and community consultation (AKA Ventures Inc., 2010a, b).

Potash.—After BHP Billiton Canada's successful acquisition of Athabasca Potash Inc., the company proposed to expand its position in the potash sector. In August, BHP Billiton launched a $40 billion hostile takeover bid for Potash Corporation of Saskatchewan Inc., which, according to the Globe and Mail (2010), was Canada's 24th ranked public company (by profit) in 2009. Potash Corp. had been the seventh ranked company in 2008, but it was adversely affected by the global economic crisis. BHP Billiton withdrew the offer in November (BHP Billiton, 2010, p. 1).

Mineral Fuels and Related Materials

Uranium.—In 2010, production of uranium decreased to 9,684 t (uranium content) from 10,176 t in 2009. The decrease was attributed to the temporary closure of the McClean mill. Shipments of uranium decreased to 9,927 t (uranium content) from 10,133 t in 2009 (Jacqueline Paquette, Head, Surveys Unit, Minerals and Mining Statistics Division of the Minerals, Metals and Materials Knowledge Branch, Natural Resources Canada, written commun., June 23, 2011).

Cameco received approval from the Canadian Nuclear Safety Commission to produce a maximum of about 8,000 t/yr of uranium at the McArthur River Mine, subject to a mine-life annual average of about 7,200 t of uranium. An ongoing upgrade to the Key Lake mill would increase the annual milling capacity to about 9,600 t by 2011. Successful reserve definition drilling in 2010 allowed Cameco to extend the Rabbit Lake complex's expected mine life by 2 years to 2018. Cameco also finished dewatering the Cigar Lake Mine, increased the mine's water-pumping capacity, continued remediation of the underground facilities, resumed underground development, and prepared to resume sinking shaft 2. The Cigar Lake project was expected to begin production in 2013 (Cameco Corp., 2011, p. 58–64, 72–75).

The McClean Lake project (a joint venture of AREVA Resources Canada Inc., Denison Mines Inc., and OURD Canada Company Ltd.) produced about 665 t of uranium (as uranium oxide) at the McClean mill from stockpiled ore in 2010 compared with the output of 1,388 t of uranium in 2009. The ore stockpile was depleted in June, and the mill was placed on care-and-maintenance status in August pending the supply of ore from the Cigar Lake Mine (Cameco Corp., 2011, p. 74; Denison Mines Corp., 2011, p. 9).

AREVA evaluated the Kiggavik project in Nunavut Territory and Cameco evaluated the Millennium project in Saskatchewan. In addition, about 100 other uranium exploration projects in Canada were active in 2010.

Reserves and Resources

Table 3 lists the levels of Canadian reserves of selected mineral commodities at the beginning of 2010. Data are shown in terms of metal contained in ore for the base and precious metals or recoverable quantities of mineral fuels. Reported reserves of major metals include metal in mines where production has been suspended temporarily. Crude petroleum reserves include estimated recovery from oil sands projects that were under active development (BP p.l.c., 2011, p. 6; Natural Resources Canada, 2011b).

The reserves of major metals, which are distributed unevenly throughout Canada, are located primarily in the Precambrian shield, the Rocky Mountains (Cordillera), and the Coast Ranges. In terms of proven and probable (minable) reserves of major metals, the Provinces of British Columbia, Manitoba, New Brunswick, Ontario, and Quebec were dominant (Natural Resources Canada, 2011b).

Outlook

Canada's mineral industry is primarily export oriented, and the United States is the main destination for exported Canadian minerals. Canada's continuing challenges in the mineral sector include globalization of the industry, especially competition from developing countries with minerals resources that were less costly to develop. With the easing of the global economic crisis and the rebound in international mineral commodity prices in 2010, the output of many mines and mineral processing plants increased. Mineral exploration activity also increased. The Canadian mineral industry is well positioned to expand, based on its mineral resource base and its access to the markets of China, Europe, Japan, and North America.

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TABLE 1

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010[p]
METALS						
Aluminum:						
Alumina, Aluminum oxide (Al_2O_3), smelter grade		1,280,770	1,280,000 [e]	1,370,000	1,125,000	1,301,000
Metal:						
Primary		3,051,128	3,082,625	3,120,148	3,030,269	2,963,210
Secondary[e]		47,084 [3]	50,000	50,000	40,000	40,000
Total[e]		3,098,212 [3]	3,130,000 [r]	3,170,000	3,070,000	3,000,000
Antimony[4]		269	193	132	64 [r]	1,000
Bismuth:						
Mine output, Bi content[4, 5]		177	137	71	86	91
Metal, refined[e]		250	250	150	150	150
Cadmium:						
Mine output, Cd content[4]		579	342	365	376 [r]	326
Metal, refined		2,094	1,388	1,409	1,299	1,300 [e]
Cobalt:						
Mine output, Co content[4, 6]		7,114	8,692	8,953	3,919 [r]	4,568
Metal, refined		5,198	5,620	5,637	4,918	4,650 [e]
Copper:						
Mine output, Cu content[4]		603,295	596,249	607,957	494,524	525,129
Metal:						
Smelter:						
Primary, blister		484,675	470,713	443,710	316,510	318,006
Secondary		35,826	46,101	41,777	29,733	31,815
Total		520,501	516,814	485,487	346,243	349,821
Refined:						
Primary[e]		469,363 [3]	423,453 [3]	412,000	310,000	290,000
Secondary[e]		31,100	30,000	30,000	25,000 [r, e]	29,000
Total		500,463	453,453	442,050	335,052 [r]	319,200
Gold, mine output, Au content	kilograms	104,448	102,377	96,501	97,367	91,024
Indium, metal[e]	do.	51,500	61,000	57,000	50,000	67,000
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	33,543	32,774	32,102	31,704	37,001
Fe content[e]	do.	21,341 [3]	20,751 [3]	20,300	20,000	23,300
Metal:						
Pig iron[7]	do.	8,305	8,577	9,000	5,000	8,000
Direct-reduced iron[7]	do.	446	911	690	300	600
Ferroalloys, electric arc furnace:[e]						
Ferrosilicon	do.	56	56	60	50	50
Silicon metal	do.	30	30	50	30	30
Ferroniobium	do.	6	7	7	7	7
Ferrovanadium	do.	1	1	1	1	1
Total	do.	90	90	110	90	90
Crude steel	do.	15,493 [7]	15,569 [7]	15,100 [e]	9,245 [r]	13,003
Lead:						
Mine output, Pb content		83,096	75,135	99,810	68,839 [r]	64,859
Metal, refined:						
Primary		115,989	95,577	105,526	101,484	105,836
Secondary		134,475	141,111	153,549	157,370	167,042
Total		250,464	236,688	259,075	258,854	272,878
Magnesium, metal, primary[e]		65,000	16,300	2,000	--	--
Molybdenum, mine output, Mo content		7,723	6,681	8,602	8,721 [r]	8,261
Nickel:						
Mine output, Ni content[4]		232,948	254,915	259,651	135,037 [r]	158,376
Refined[8]		146,899	153,647	167,732	116,909	105,413

See footnotes at end of table.

TABLE 1—Continued

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010[p]
METALS—Continued						
Niobium (columbium) and tantalum:						
Pyrochlore concentrate:						
Gross weight[e]		12,500	12,500	13,200	12,900	13,200
Nb content of ferroniobium		4,177	4,337	4,383	4,330	4,419
Tantalite concentrate:						
Gross weight[e]		249	201	150	110	--
Ta content (Ta_2O_5)		68	55	49	30	--
Nb content		10	9	6 [e]	5	--
Platinum-group metals, mine output:						
Palladium[e]	kilograms	14,900 [r]	14,100 [r]	14,700 [r]	7,000 [r]	6,200
Platinum[e]	do.	8,500 [r]	8,000 [r]	8,500 [r]	4,000 [r]	3,600
Others (iridium/rhodium/ruthenium)[e]	do.	1,000 [r]	900 [r]	1,000 [r]	400 [r]	400
Total	do.	24,389	23,079	24,173	11,376 [r]	10,215
Selenium[9]	do.	106,000	144,000	156,000	173,000	79,000
Silver:						
Mine output, Ag content	do.	995,024	860,449	755,103	617,777 [r]	596,061
Refined	do.	1,544,705	1,213,118	1,324,499	1,287,659	1,640,612
Tellurium[5, 9]	do.	10,000	14,000	19,000	16,000	8,000
Titanium, Sorelslag®[10]		930,000	960,000	1,000,000	765,000 [r, e]	1,000,000 [e]
Tungsten, mine output, W content[5]		1,983 [r]	2,305 [r]	2,277 [r]	1,964 [r]	420
Zinc:						
Mine output, Zn content		637,956	630,485	750,502	699,145 [r]	648,905
Metal, refined, primary		824,464	802,103	764,310	685,504 [r]	691,222
INDUSTRIAL MINERALS						
Asbestos[e]		200,000	180,000	160,000	150,000	100,000
Barite[5]		20,000	9,000	12,000	15,000	22,000
Cement, hydraulic[5]	thousand metric tons	14,336	15,078	13,672	10,985	12,431
Clay and clay products[11]	value, thousands	$197,000	$195,000	$187,768	$135,613	$156,554
Diamond	carats	13,278,000	17,144,000	14,803,000	10,946,000	11,773,000
Diatomite[e]		10,000	10,000	10,000	8,000	8,000
Gemstones, includes amethyst and jade		68	67	67	49	22
Graphite[e]		28,000	28,000	27,000	25,000	25,000
Gypsum and anhydrite[12]	thousand metric tons	9,036	7,562	5,740	3,540	2,717
Lime[5]	do.	2,189	2,134	2,069	1,601	1,913
Lithium, spodumene[e]		22,500	23,000	22,000	10,000	--
Magnesite, dolomite, brucite[e]		140,000 [r, e]	140,000 [r, e]	140,000 [r, e]	140,000 [r, e]	150,000 [e]
Mica, scrap and flake[e]		17,500	18,000	17,000	15,000	15,000
Nepheline syenite		734,000	690,000	734,000	513,000	581,000
Nitrogen, N content of ammonia		4,100,000 [e]	4,498,000	4,781,000	4,000,000	4,000,000
Peat	thousand metric tons	1,245	1,282	1,151	1,131	1,262
Phosphate rock, P_2O_5 content[e]	do.	165	210	210	200	210
Potash, K_2O equivalent	do.	8,518	11,085	10,455	4,318	9,788
Pyrite and pyrrhotite, gross weight[e]		-- [r, e]	-- [r, e]	-- [r, e]	-- [r, e]	--
Salt	thousand metric tons	14,389	11,862	14,386	14,651	10,537
Sand and gravel	do.	238,515	240,723	239,646	216,170	205,804
Silica, quartz[5, 12]	do.	2,146	1,987	1,979	1,296	1,171
Sodium compounds, including sodium sulfate, natural[e, 13]	do.	180	150	200	210	210
Stone[12, 14]	do.	153,897	149,982	145,825	135,895	147,643
Sulfur, byproduct:						
Metallurgy	do.	1,176	1,167 [r]	1,148 [r]	890 [r]	900 [e]
Petroleum	do.	7,906	7,622 [r]	7,008 [r]	6,577 [r]	6,355
Total	do.	9,082	8,789 [r]	8,156 [r]	7,467 [r]	7,255 [e]
Talc, pyrophyllite, soapstone[e]	do.	72	79	70	44	96

See footnotes at end of table.

TABLE 1—Continued

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010[p]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		180,000	195,000	180,000	120,000 [r]	130,000
Coal, run of mine:						
Bituminous and subbituminous	thousand metric tons	55,562	58,822	57,800	52,500 [e]	57,000 [e]
Lignite	do.	10,440	10,541	9,900	10,400 [e]	11,000 [e]
Total	do.	66,002	69,363	67,749	62,935 [r]	67,876
Coke, high-temperature	do.	4,325	4,304	3,040	2,800 [e]	3,000 [e]
Natural gas:						
Gross (excluding gas flared or recycled)	million cubic meters	220,432	215,649	208,653	196,168	189,589
Marketed	do.	171,641	167,195	157,949	145,133	144,378
Natural gas liquids:						
Gas plant liquids	thousand 42-gallon barrels	194,000	196,000	182,000	174,000	168,000 [e]
Pentanes plus	do.	55,000	57,000	55,000	51,900	50,000 [e]
Condensate	do.	9,800	10,600	11,200	9,500	8,700 [e]
Total	do.	258,800	263,600	248,200	235,400	230,000 [e]
Petroleum:						
Crude[15]	do.	904,000	941,000	934,000	933,000	990,000 [e]
Refinery products:						
Propane and butane	do.	20,385	22,019	21,339	20,400	21,600 [e]
Gasoline:						
Aviation	do.	702	700	700 [e]	550 [r, e]	500 [e]
Motor	do.	293,741	279,200	258,000 [e]	262,000 [e]	262,000 [e]
Petrochemical feedstocks	do.	29,251	35,000	30,000 [e]	20,000 [r, e]	34,000 [e]
Jet fuel	do.	32,983	31,600	32,000 [e]	30,000 [r, e]	30,000 [e]
Kerosene	do.	3,717	11,800	11,000 [e]	9,900 [e]	5,000 [e]
Diesel and light fuel oil	do.	247,064	228,300	226,000 [e]	220,000 [r, e]	225,000 [e]
Lubricants including grease	do.	8,458	7,500	8,000 [e]	7,000 [r, e]	7,200 [e]
Heavy fuel oil	do.	63,615	55,500	52,000 [e]	42,000 [e]	44,000 [e]
Asphalt	do.	29,254	26,000	26,000 [e]	25,000 [e]	27,000 [e]
Petroleum coke	do.	10,909	10,300	10,000 [r, e]	9,000 [r, e]	8,500 [e]
Other petroleum products	do.	32,119	29,500	30,000 [r, e]	35,000 [r, e]	34,000 [e]
Refinery fuel and losses[16]	do.	37,704	33,000 [r, e]	33,000 [r, e]	33,000 [r, e]	35,000 [e]
Total	do.	809,902	740,419	711,000 [e]	712,000 [e]	730,000 [e]
Uranium oxide, U content		9,862	9,475	9,001	10,176	9,684 [e]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through June 23, 2011.

[2] In addition to the commodities listed, aluminum hydroxide $Al(OH)_3$ (hydrate), cesium, ilmenite, ore containing indium, pumice, and zeolite are produced, but available information is inadequate to estimate output.

[3] Reported.

[4] Metal content of concentrates produced.

[5] Producers' shipments and quantities used by producers.

[6] Cobalt content of all products derived from Canadian ores, which include cobalt oxide shipped to the United Kingdom for further processing and nickel-cobalt matte shipped to Norway for refining.

[7] Source of iron and steel data: World Steel Association (Worldsteel).

[8] Nickel contained in products of smelters and refineries in forms that are ready for use by consumers. Natural Resources Canada has revised all refined nickel figures to conform with International Nickel Study Group (INSG) guidelines.

[9] Includes metal refined from imports and secondary sources. Also includes metal content of exported concentrates.

[10] Refined Sorelslag® has been upgraded to 95% titanium oxide.

[11] Includes bentonite products from common clay, fire clay, stoneware clay, and other clays. Values are in current Canadian dollars. If necessary, values can be converted from Canadian dollars (CAN$) to U.S. dollars (US$) at an average rate of CAN$1.074=US$1.00.

[12] Shipments; excludes shipments to Canadian cement, clay, and lime plants.

[13] Excludes byproduct production from chemical plants.

[14] Crushed, building, ornamental, paving, and similar stone.

[15] Includes synthetic crude from oil shale and (or) tar sands.

[16] Refinery fuel represents total production of still gas, which includes a small amount sold.

TABLE 2

CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina:			
Smelter grade	Rio Tinto Alcan Inc. (Rio Tinto Group, 100%)	Vaudreuil refinery, Jonquiere, Quebec	1,300.
Specialty grade	do.	do.	55.
Do.	Axens Canada Specialty Aluminas Inc. (Axens S.A., 100%)	Alumina plant, Brockville, Ontario	18.
Aluminum	Alcoa Ltd. (Alcoa Inc., 100%)	Smelter in Baie-Comeau, Quebec	385.
Do.	Aluminerie Alouette Inc. (Rio Tinto Alcan Inc., 40%; Aluminium Austria Metall Québec, 20%; Hydro Aluminum, 20%; Société générale de financement du Québec, 13.33%; Marubeni Québec Inc., 6.67%)	Smelter in Sept-Iles, Quebec	572.
Do.	Aluminerie de Bécancour Inc. (Alcoa Inc., 75%, and Rio Tinto Alcan Inc., 25%)	Smelter in Beacancour, Quebec	413.
Do.	Aluminerie Lauralco Inc. (Alcoa Inc., 100%)	Smelter in Deschambault, Quebec	260.
Do.	Rio Tinto Alcan Inc. (Rio Tinto Group, 100%)	Smelter in Alma, Quebec	435.
Do.	do.	Smelter in Arvida, Jonquiere, Quebec	172.
Do.	do.	Smelter in Grande-Baie, Quebec	215.
Do.	do.	Smelter in Kitimat, British Columbia	277.
Do.	do.	Smelter in Laterriere, Quebec	235.
Do.	do.	Smelter in Shawinigan, Quebec	100.
Antimony ore	Beaver Brook Antimony Mine Inc. (Hunan Nonferrous Metals Corp., 100%)	Beaver Brook Mine, 43 kilometers southwest of Glenwood, Newfoundland	180.
Asbestos, fiber	Jeffrey Mine Inc.	Jeffrey Mine,[2] Asbestos, Quebec	NA.
Do.	LAB Chrysotile, Inc.	Lac d'Amiante du Quebec, Ltee, Quebec	160.
Bismuth ore			
Ore	Xstrata Zinc	Brunswick Mine, about 25 kilometers southeast of Bathurst, New Brunswick	NA.
Metal	do.	Belledune lead smelter, Belledune, New Brunswick	NA.
Do.	Teck Resources Ltd.	Trail smelter and refinery complex, Trail, British Columbia	300.
Cement	Ciment Québec Inc.	Saint-Basile, Quebec	1,571.
Do.	ESSROC Canada Inc. (Italcementi Group)	Picton, Ontario	792.
Do.	Federal White Cement Ltd.	Woodstock, Ontario	544.
Do.	Holcim (Canada) Inc. (Holcim AG)	Joliette, Quebec	1,475.
Do.	do.	Mississauga, Ontario	2,000.
Do.	Lafarge Canada Inc. (Lafarge North America)	Bath, Ontario	1,176.
Do.	do.	Woodstock, Ontario	814.
Do.	do.	Exshaw, Alberta	1,422.
Do.	do.	Kamloops, British Columbia	324.
Do.	do.	Richmond, British Columbia	1,319.
Do.	do.	St. Constant, Quebec	1,157.
Do.	do.	Brookfield, Nova Scotia	621.
Do.	Lehigh Inland Cement Ltd. (HeidelbergCement Group)	Edmonton, Alberta	1,380.
Do.	do.	Delta, British Columbia	1,356.
Do.	St. Marys Cement (Canada) Inc. (Votorantim Cimentos S.A.)	Bowmanville, Ontario	1,377.
Do.	do.	St. Marys, Ontario	645.
Coal:			
Bituminous:			
Coking	Grande Cache Coal Corp.	Grande Cache Mine, near Grande Cache, Alberta	2,000.
Do.	Peace River Coal Inc. (Anglo Coal Canada, 74.51%; Vitol Anker International B.V., 13.36%; Northern Energy and Mining Inc., 12.31%)	Trend open pit mine, near Tumbler Ridge, British Columbia	2,000.
Do.	Teck Coal Partnership (Teck Resources Ltd., 100%)	Fording River open pit mine, near Elkford, British Columbia	8,900.
Do.	do.	Cardinal River open pit mine, near Hinton, Alberta	2,200.

See footnotes at end of table.

TABLE 2—Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal—Continued:			
Bituminous—Continued:			
Coking—Continued	Teck Coal Partnership (Teck Resources Ltd., 100%)	Coal Mountain open pit mine at Sparwood, British Columbia	2,700.
Do.	do.	Line Creek Mine, near Sparwood, British Columbia	2,700.
Do.	Teck Coal Partnership (Teck Resources Ltd., 95%)	Elkview open pit mine, near Sparwood, British Columbia	5,500.
Do.	Teck Coal Partnership (Teck Resources Ltd., 80%)	Greenhills open pit mine, near Elkford, British Columbia	5,100.
Do.	Western Canadian Coal Corp.	Wolverine Creek open pit mine, near Tumbler Ridge, British Columbia	3,000.
Do.	do.	Brule Mine, near Chetwynd, British Columbia	2,000.
Do.	do.	Willow Creek Mine, 45 kilometers from Chetwynd, British Columbia	1,700
Steam	NB Power	Minto Mine, near Minto, New Brunswick	NA.
Do.	Pioneer Coal Ltd.	Stellarton Mine, near Stellarton, Nova Scotia	NA.
Do.	Sherritt International Corp.	Coal Valley Mine, near Edson, Alberta	3,600.
Do.	Vitol Anker International B.V.	Quinsam Mine, near Campbell River, British Columbia	500.
Lignite	Prairie Mines & Royalty Ltd. (Sherritt International Corp.)	Boundary Dam open pit mine, near Estevan, Saskatchewan	6,500.
Do.	do.	Poplar River open pit mine, near Coronach, Saskatchewan	4,000.
Do.	do.	Bienfait open pit mine, near Bienfait, Saskatchewan	2,800.
Subbituminous	do.	Highvale open pit mine, near Seba Beach, Alberta	13,000.
Do.	do.	Genesee open pit mine, near Warburg, Alberta	5,600.
Do.	do.	Sheerness open pit mine, near Hanna, Alberta	4,000.
Do.	do.	Paintearth open pit mine, near Forestburg, Alberta	3,500.
Do.	do.	Whitewood open pit mine, near Seba Beach, Alberta	1,400.
Copper:			
Ore, Cu content	Highland Valley Copper Partnership (Teck Resources Ltd., 97.5%, and Highmont Mining Co., 2.5%)	Highland Valley Copper Mine, Kamloops, British Columbia	190.
Do.	Vale Canada Ltd. (Vale S.A.)	Sudbury mines (includes the Coleman, Copper Cliff North, Creighton, Garison, Gertrude,[2] and Stobie Mines), Ontario	112.
Do.	HudBay Minerals Inc.	Trout Lake and 777 Mines, Manitoba	57.
Do.	Vale Newfoundland & Labrador Ltd. (Vale S.A.)	Voisey's Bay mines (includes the Ovoid Mine), Newfoundland and Labrador	55.
Do.	Xstrata Nickel (Xstrata plc, 100%)	Kidd Creek Mine, about 20 kilometers north of Timmins, Ontario	50.
Do.	Huckleberry Mines Ltd. (Imperial Metals Corp., 50%, and consortium composed of Mitsubishi Materials Corp., Marubeni Corp., Dowa Metals and Mining Company, Ltd., and Furukawa Company, Ltd., 50%)	Huckleberry Mine, 123 kilometers southwest of Houston, British Columbia	37.
Do.	Northgate Minerals Corp.	Kemess South Mine, British Columbia	37.
Do.	Taseko Mines Ltd.	Gibraltar Mine, British Columbia	31.
Do.	Mount Polley Mining Corp. (Imperial Metals Corp., 100%)	Mount Polley Mine at Williams Lake, British Columbia	31.
Do.	NVI Mining Ltd. (Breakwater Resources Ltd.)	Myra Falls (Battle-Gap and H-W Mines), British Columbia	28.

See footnotes at end of table.

TABLE 2—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper—Continued:				
Ore, Cu content—Continued		Imperial Metals Corp.	Mount Polley Mine, 8 kilometers southwest of Likely, British Columbia	27.
Do.		Sherwood Copper Corp.	Minto Mine, Yukon	23.
Do.		Xstrata Nickel (Xstrata plc, 100%)	Fraser Morgan and Nickel Rim South Mines, Sudbury division, Sudbury, Ontario	23.
Do.		Quadra FNX Mining Ltd.	Podolsky Mine, Ontario	13.
Do.		Teck Resources Ltd.	Duck Pond Mine, about 100 kilometers southwest of Grand Falls-Windsor, Newfoundland and Labrador	13.
Do.		Agnico-Eagle Mines Ltd.	LaRonde Mine, about 650 kilometers northwest of Montreal, Quebec	9.
Do.		Inmet Mining Corp.	Troilus Mine, Quebec	7.
Do.		Xstrata Zinc (Xstrata plc, 100%)	Brunswick Mine, 20 kilometers southwest of Bathurst, New Brunswick	7.
Do.		Xstrata Nickel (Xstrata plc, 100%)	Raglan Mine, Quebec	7.
Do.		North American Palladium Ltd.	Lac des Iles Mine, about 85 kilometers northwest of Thunder Bay, Ontario	3.
Do.		Xstrata Nickel (Xstrata plc, 100%)	Montcalm Mine, Ontario	2.
Smelter:				
Anode		Xstrata Copper (Xstrata plc, 100%)	Horne Smelter in Noranda, Quebec	180.
Do.		do.	Smelter at Kidd Creek metallurgical facility, about 20 kilometers northeast of Timmins, Ontario	150.
Do.		Vale Canada Ltd. (Vale S.A.)	Copper Cliff smelter in Sudbury, Ontario	500.
Do.		HudBay Minerals Inc.	Smelter in Flin Flon, Manitoba	90.
Copper-nickel matte		Xstrata Nickel (Xstrata plc, 100%)	Sudbury smelter, Ontario	130.
Refinery (Cu cathode)		Xstrata Copper (Xstrata plc, 100%)	CCR Refinery in Montreal-Est, Quebec	265.
Do.		do.	Kidd Creek refinery, about 20 kilometers northeast of Timmins, Ontario	140.
Diamond	carats	Diavik Diamond Mines Inc. (Rio Tinto plc, 60%, and and Harry Winston Diamond Mines Ltd., 40%)	Diavik open pit mine (includes the A154 North and the A154 South kimberlite pipes), northeast of Yellowknife region, Northwest Territories	11,900,000.
Do.	do.	BHP Billiton Canada Inc. (BHP Billiton Group, 80%)	Ekati Mine (includes the Koala and the Panda underground mines and the Beartooth, Fox, Koala, and Misery open pit mines) in the Lac de Gras region, Northwest Territories	4,600,000.
Do.	do.	De Beers Canada Inc. (De Beers Group)	Snap Lake underground mine, 220 kilometers northeast of Yellowknife, Northwest Territories	1,400,000.
Do.	do.	do.	Victor open pit mine, 90 kilometers west of Attawapiskat, Ontario	600,000.
Do.	do.	Joint venture of Tahera Diamond Corp., 84%, and Teck Resources Ltd., 16%	Jericho Mine,[2] 420 kilometers northeast of Yellowknife, Nunavut Territory	500,000.
Gold, Au content of ore	kilograms	Agnico-Eagle Mines Ltd.	Lapa Mine, about 60 kilometers west of Val-d'Or, Quebec	40,000.
Do.	do.	do.	LaRonde Mine, about 60 kilometers west of Val-d'Or, Quebec	5,600.
Do.	do.	do.	Goldex Mine, Val-d'Or, Quebec	5,000.
Do.	do.	Alexis Minerals Corp.	Lac Herbin Mine, about 10 kilometers northeast of Val-d'Or, Quebec	5,000.
Do.	do.	Anaconda Mining Inc.	Pine Cove Mine, near Baie Verte, Newfoundland and Labrador	400.
Do.	do.	Aurizon Mines Ltd.	Casa Berardi Mine, about 95 kilometers north of La Sarre, Quebec	5,000.
Do.	do.	Barkerville Gold Mines Ltd.	QR Mine, British Columbia	2,200.

See footnotes at end of table.

TABLE 2—Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold, Au content of ore—Continued	kilograms	Barrick Gold Inc.	Hemlo operation, includes David Bell underground mine and Williams open pit and underground mine, about 250 kilometers east of Thunder Bay, Ontario	8,100.
Do.	do.	Brigus Gold Corp.	Black Fox Mine, near Timmins, Ontario	25,000.
Do.	do.	Capstone Mining Corp.	Minto Mine, about 240 kilometers northwest of Whitehorse, Yukon Territory	650.
Do.	do.	Century Mining Corp.	Sigma-Lamaque complex (includes the Sigma Mine and the Lamaque Mine), Val-d'Or, Quebec	1,400.
Do.	do.	Claude Resources Inc.	Seabee operations (includes the Seabee and the Santoy 7 Mines), Laonil Lake, Saskatchewan	1,800.
Do.	do.	Goldcorp Inc.	Musselwhite Mine, 480 kilometers north of Thunder Bay, Ontario	7,000.
Do.	do.	do.	Porcupine Mine, Timmins, Ontario	9,100.
Do.	do.	do.	Red Lake Mine (includes Red Lake and the Campbell complexes), 180 kilometers north of Dryden, Ontario	26,000.
Do.	do.	Huckleberry Mines Ltd. (Imperial Metals Corp., 50%, and a consortium consisting of Mitsubishi Materials Corp., Marubeni Corp., Dowa Metals & Mining Company, Ltd., and Furukawa Company, Ltd., 50%)	Huckleberry Mine, 123 kilometers southwest of Houston, British Columbia	95.
Do.	do.	Hudson Bay Mining and Smelting Company Ltd. (HudBay Minerals Inc., 100%)	777 and Trout Lake Mines, Flin Flon, Manitoba	1,400.
Do.	do.	Huakan International Mining Inc.	Greenwood Gold project[2] (includes the Lexington-Grenoble Mine), near Greenwood, British Columbia	600.
Do.	do.	IAMGOLD Corp.	Doyon division (includes the Mouska Mine), about 40 kilometers east of Rouyn-Noranda, Quebec	4,100.
Do.	do.	Imperial Metals Corp.	Mount Polley Mine, 8 kilometers southwest of Likely, British Columbia	1,700.
Do.	do.	Inmet Mining Corp.	Trolius Mine, about 175 kilometers north of Chibougamau, Quebec	5,000.
Do.	do.	Kirkland Lake Gold Inc.	South Mine complex (Macassa Mine, Ontario)	1,800.
Do.	do.	Metanor Resources Inc.	Bachelor Lake mill (located about 225 kilometers northeast of Val-d'Or, Quebec) processed preproduction ore from the Barry open pit, which was located about 65 kilometers southeast of the mill	1,000.
Do.	do.	North American Palladium Ltd.	Lac des Iles Mine, about 85 kilometers northwest of Thunder Bay, Ontario	800.
Do.	do.	do.	Sleeping Giant Mine, about 80 kilometers north of Amos, Quebec	2,100.
Do.	do.	Northgate Minerals Corp.	Kemess South Mine, British Columbia	9,700.
Do.	do.	NVI Mining Ltd. (Breakwater Resources Ltd.)	Myra Falls complex (Battle-Gap and H-W Mines), British Columbia	1,000.
Do.	do.	Quadra FNX Mining Ltd.	Levack complex (includes the Levack Mine and the McCreedy West Mine), near Levack, Ontario	125.
Do.	do.	do.	Podolsky Mine, Ontario	170.
Do.	do.	San Gold Corp.	Hinge Mine and Rice Lake Mine, Manitoba	16,000.
Do.	do.	Richmont Mines Inc.	Island Gold Mine, near Dubreuilville, Ontario	1,600.

See footnotes at end of table.

TABLE 2—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold, Au content of ore—Continued	kilograms	Richmont Mines Inc., 50%, and Louvem Mines Inc., 50%	Beaufor Mine, about 21 kilometers northeast of Val-d'Or, Quebec	1,250.
Do.	do.	Teck Resources Ltd.	Duck Pond Mine, about 100 kilometers southwest of Grand Falls-Windsor, Newfoundland and Labrador	125.
Do.	do.	Vale Canada Ltd. (Vale S.A.)	Manitoba division (includes the Birchtree Mine and the Thompson Mine), Thompson, Manitoba	NA.
Do.	do.	do.	Ontario division, includes Garson Mine, Garson, Ontario; Coleman/McCreedy East Mine, near Levack, Ontario; and Stobie Mine, north of Sudbury, Ontario	NA.
Do.	do.	Wesdome Gold Mines Ltd.	Eagle River Mine, about 50 kilometers west of Wawa, Ontario	1,600.
Do.	do.	do.	Kiena Mine, about 10 kilometers west of Val-d'Or, Quebec	1,300.
Do.	do.	Xstrata Copper (Xstrata plc, 100%)	CCR Refinery in Montreal-Est, Quebec	NA.
Do.	do.	Xstrata Zinc (Xstrata plc, 100%)	Brunswick Mine, 20 kilometers southwest of Bathurst, New Brunswick	NA.
Indium	metric tons	Teck Resources Ltd.	Trail smelter and refinery complex, British Columbia	70.
Do.	do.	Xstrata plc	Kidd Creek metallurgical complex, Ontario[2]	15.
Iron and steel:				
Iron ore:				
Ore		ArcelorMittal Mines Canada (ArcelorMittal)	Fire Lake and Mont-Wright open pit mines, Quebec	19,300.
Do.		Iron Ore Company of Canada (Rio Tinto Ltd., 58.72%; Mitsubishi Corp., 26.18%; Labrador Iron Ore Royalty Income Fund, 15.1%)	Carol Lake open pit mine, Labrador City, Newfoundland and Labrador	17,000.
Do.		Wabush Mines Ltd. (Cliffs Natural Resources Inc.)	Scully Mine, near Wabush, Newfoundland and Labrador	6,200.
Magnetite for coal washing		Craigmont Mines Ltd.	Reprocessed tailings near Merritt, British Columbia	NA.
Pellets		Iron Ore Company of Canada (Rio Tinto Ltd., 58.72%; Mitsubishi Corp., 26.18%; Labrador Iron Ore Royalty Income Fund, 15.1%)	Pelleting plant, Labrador City, Newfoundland and Labrador	13,000.
Steel, crude		AltaSteel Ltd. (OneSteel Ltd.)	Edmonton, Alberta	320.
Do.		ArcelorMittal Dofasco Inc. (ArcelorMittal)	Hamilton, Ontario	4,100.
Do.		ArcelorMittal Canada Inc. (ArcelorMittal)	Contrecoeur East and Contrecoeur West plants, Quebec	2,500.
Do.		Essar Steel Algoma Inc. (Essar Global Ltd.)	Sault Ste. Marie, Ontario	2,800.
Do.		Gerdau Steel North America Inc. (Gerdau S.A.)	Whitby, Ontario	790.
Do.		do.	Selkirk, Manitoba	430.
Do.		do.	Cambridge, Ontario	380.
Do.		Hamilton Speciality Bar (2007) Inc.	Hamilton, Ontario	360.
Do.		Ivaco Rolling Mills Inc.	L'Orignal, Ontario	380.
Do.		MMFX Steel of Canada Inc. (MMFX Technologies Corp.)	Welland, Ontario	120.
Do.		QIT-Fer et Titane Inc. (Rio Tinto Iron and Titanium Inc.)	Sorel, Quebec	500.
Do.		SSAB Svenskt Stål AB—IPSCO Division	Regina, Saskatchewan	1,500.
Do.		U.S. Steel Canada (United States Steel Corp.)	Lake Erie Works, Naticoke, Ontario	2,400.
Do.		do.	Hamilton Works,[2] Hamilton, Ontario	2,300.
Lead:				
Lead-zinc ore		Xstrata Zinc (Xstrata plc, 100%)	Brunswick Mine in Bathurst, New Brunswick	3,550.

See footnotes at end of table.

TABLE 2—Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Lead—Continued:			
Lead-zinc ore—Continued:	Maple Minerals Corp.	Caribou underground mine,[2] 45 kilometers west of Bathurst, New Brunswick	700.
Do.	NVI Mining Ltd. (Breakwater Resources Ltd.)	Myra Falls complex (Battle-Gap and H-W Mines), British Columbia	800.
Do.	ScoZinc Ltd. (Acadian Mining Corp.)	Scotia open pit mine,[2] Gays River, Nova Scotia	600.
Refined:			
Primary	Teck Resources Ltd.	Trail smelter and refinery complex, Trail, British Columbia	100.
Do.	Xstrata Zinc (Xstrata plc, 100%)	Belledune smelter and refinery, 35 kilometers north of Bathurst, New Brunswick	74.
Secondary, includes lead alloys	NovaPb Inc. (Newalta Corp.)	Ville Sainte Catherine, Quebec	100.
Do.	Tonolli Canada Ltd.	Mississauga, Ontario	35.
Do.	Metalex Products Ltd.	Richmond, British Columbia	8.
Molybdenum, ore, Mo content metric tons	Highland Valley Copper Partnership (Teck Resources Ltd., 97.5%, and Highmont Mining Co., 2.5%)	Highland Valley Copper Mine, Kamloops, British Columbia	1,900.
Do. do.	Huckleberry Mines Ltd. (Imperial Metals Corp., 50%, and a consortium composed of Mitsubishi Materials Corp., Marubeni Corp., Dowa Metals and Mining Co., Ltd., and Furukawa Co., Ltd., 50%)	Huckleberry Mine, 123 kilometers southwest of Houston, British Columbia	85.
Do. do.	FortyTwo Metals Inc. (Roca Mines Inc., 100%)	Max Mine, about 60 kilometers southeast of Revelstoke, British Columbia	1,800.
Do. do.	Joint venture of Thompson Creek Metals Company Inc. (75%) and Sojitz Moly Resources, Inc. (25%)	Endako Mine, near Fraser Lake, about 160 kilometers northwest of Prince George, British Columbia	5,200.
Nickel:			
Ore, Ni content	Crowflight Minerals Inc.	Bucko Lake Mine, near Wabowden, Manitoba	2.
Do.	First Nickel Inc.	Lockerby Mine,[2] Sudbury district, Ontario	2.
Do.	Liberty Mines Inc.	McWatters Mine, about 30 kilometers southeast of Timmins, Ontario, and the Redstone Mine, about 25 kilometers southeast of Timmins, Ontario	3.
Do.	Quadra FNX Mining Ltd.	Levack complex[2] (includes the Levack Mine and the McCreedy West Mine), near Levack, Ontario	5.
Do.	do.	Podolsky Mine, Ontario	1.
Do.	Ursa Major Minerals Inc.	Shakespeare Mine. Sudbury, Ontario	1.
Do.	Vale Canada Ltd. (Vale S.A.)	Sudbury mines (includes the Coleman, Copper Cliff North, Copper Cliff South,[2] Creighton, Garson, Gertrude,[2] and Stobie Mines), Ontario	106.
Do.	do.	Manitoba division (includes the Birchtree Mine and the Thompson Mine), Thompson, Manitoba	45.
Do.	Vale Newfoundland & Labrador Ltd. (Vale S.A.)	Voisey's Bay Mines (includes the Ovoid Mine), Newfoundland and Labrador	60.
Do.	Xstrata Nickel (Xstrata plc, 100%)	Raglan Mine in Ungave, Quebec	27.
Do.	do.	Fraser Morgan and Nickel Rim South Mines in the Sudbury district, Ontario	NA.
Smelter	Vale Canada Ltd. (Vale S.A.)	Smelter in Sudbury, Ontario	110 (Ni oxide).
Do.	do.	Smelter in Thompson, Manitoba	82 (Ni anode).
Do.	Xstrata Nickel (Xstrata plc, 100%)	Sudbury smelter in Sudbury, Ontario	130 (Cu-Ni matte).

See footnotes at end of table.

TABLE 2—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel—Continued:			
Refinery	The Cobalt Refinery Company Inc. (Moa joint venture of General Nickel S.A., 50%, and Sherritt International Corp., 50%)	Refinery in Fort Saskatchewan, Alberta	33 (Ni briquets and powder), 4 (Co briquets and powder).
Do.	Vale Canada Ltd. (Vale S.A.)	Refinery in Sudbury, Ontario	57 (Ni pellets and powder).
Do.	do.	Refinery in Thompson, Manitoba	NA.
Niobium (columbium) metric tons	IAMGOLD Corp.	Niobec Mine, Chicoutimi, Quebec	3,450 (Nb content).
Petroleum, refinery products barrels per day	Chevron Canada Ltd. (Chevron Corp., 100%)	Burnaby refinery, Burnaby, British Columbia	55,000.
Do. do.	Consumers' Co-operative Refineries Ltd. (Federated Co-operatives Ltd., 100%)	Regina, Saskatchewan	100,000.
Do. do.	Husky Energy Inc.	Prince George refinery, Prince George, British Columbia	10,000.
Do. do.	do.	Lloydminster asphalt refinery, Lloydminster, Alberta	25,000.
Do. do.	Imperial Oil Ltd. (Exxon Mobil Corp., 69.6%)	Dartmouth refinery, Halifax Nova Scotia	82,000.
Do. do.	do.	Nanticoke refinery, 40 kilometers southwest of Hamilton, Ontario	112,000.
Do. do.	do.	Sarnia refinery, Sarnia, Ontario	121,000.
Do. do.	do.	Strathcona refinery, Edmonton, Alberta	187,000.
Do. do.	Irving Oil Ltd.	Irving refinery, Saint John, New Brunswick	250,000.
Do. do.	Moose Jaw Refinery (Gibson Energy ULC)	Moose Jaw asphalt refinery, Moose Jaw, Saskatchewan	4,100.
Do. do.	North Atlantic Refining Ltd. (Harvest Operations Corp.)	North Atlantic refinery, Come by Chance, Newfoundland and Labrador	115,000.
Do. do.	Shell Canada Ltd. (Royal Dutch Shell plc, 100%)	Montreal East refinery,[2] Montreal East, Quebec	130,000.
Do. do.	do.	Scotford refinery, 40 kilometers northeast of Edmonton, Alberta	100,000.
Do. do.	do.	Sarnia manufacturing center (Corunna refinery), Sarnia, Ontario	72,000.
Do. do.	Suncor Energy Inc.	Edmonton refinery, Edmonton, Alberta	135,000.
Do. do.	do.	Montreal refinery, Montreal East, Quebec	129,800.
Do. do.	do.	Sarnia refinery, Sarnia, Ontario	85,000.
Do. do.	Ultramar Ltd. (Valero Energy Corp., 100%)	Jean Gaulin refinery, Levis, Quebec	265,000.
Potash (K_2O equivalent)	Agrium Products Inc.	Vanscoy, Saskatchewan	1,750.
Do.	Mosaic Potash Colonsay ULC (The Mosaic Co., 100%)	Colonsay, Saskatchewan	1,800.
Do.	Mosaic Potash Esterhazy Limited Partnership Ltd. [The Mosaic Co., 75%, and Potash Corp. of Saskatchewan Inc. (PotashCorp.), 25%]	Esterhazy, southeast Saskatchewan	5,300.
Do.	The Mosaic Co.	Belle Plaine, Saskatchewan	2,800.
Do.	Potash Corp. of Saskatchewan Inc. (PotashCorp)	Lanigan, near Lanigan, Saskatchewan	3,828.
Do.	do.	Rocanville, southeast Saskatchewan	3,044.
Do.	do.	Allan division, Allan, Saskatchewan	1,885.
Do.	do.	Cory, near Saskatoon, Saskatchewan	1,361.
Do.	do.	Patience, near Saskatoon, Saskatchewan	1,033.
Do.	do.	Sussex, New Brunswick	785.
Salt:			
Rock salt and brine operations	The Canadian Salt Co. Ltd.	Rock salt mine at Ojibway, Ontario, and brine wells near Windsor, Ontario	2,600.
Do.	do.	Pugwash, Nova Scotia	1,400.
Do.	Potash Corp. of Saskatchewan Inc. (PotashCorp)	Sussex, New Brunswick	700.
Rock salt	Sifco Canada Inc. (Compass Minerals Group Inc.)	Goderich Harbour, Ontario	6,500.
Do.	Seleine Mines Division of The Canadian Salt Co.	Iles-de-la-Magdalen, Quebec	1,625.

See footnotes at end of table.

TABLE 2—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Salt—Continued:			
Rock salt—Continued:	Mosaic Potash Esterhazy Limited Partnership Ltd. [The Mosaic Co., 75%, and Potash Corp. of Saskatchewan Inc. (PotashCorp.), 25%]	Esterhazy, southeast Saskatchewan	NA.
Do.	NSC Minerals Inc.	Salt recovery from potash tailings at Rocanville and Vanscoy, Saskatchewan	NA.
Brine	Nexen Inc. and Albchem Industries Ltd.	Plant near Bruderheim, Alberta	NA.
Do.	Dow Chemical Canada Inc.	Fort Saskatchewan, Alberta	NA.
Do.	Junex Solnat (Junex Inc.)	Becancour, Quebec	NA.
Do.	Saskatoon Chemicals Holdings, Inc.	Plant near Saskatoon, Saskatchewan	NA.
Do.	Sifco Canada Inc. (Compass Minerals Group Inc.)	Amherst, Nova Scotia	NA.
Do.	do.	Plant near Unity, Saskatchewan	NA.
Do.	The Canadian Salt Co. Ltd.	Belle Plaine, Saskatchewan	NA.
Do.	do.	Lindberg, Alberta	NA.
Tantalum, Ta_2O_5 content metric tons	Cabot Corp.	Tanco Mine, Bernic Lake, Manitoba[2]	80.
Titanium, TiO_2 slag	QIT-Fer et Titane, Inc. (Rio Tinto Group, 100%)	Sorel-Tracy, Quebec	1,100 (Sorelslag®); 250 (UGS™ slag); NA (RTCS™ slag).
Tungsten, WO_3 content	North American Tungsten Corporation Ltd.	Cantung Mine, Northwest Territories	3,500.
Uranium, oxide metric tons	Joint venture of Cameco Corp., 70%, and AREVA Resources Canada Inc., 30%	McArthur River Mine, Saskatchewan	8,000.
Do. do.	Joint venture of Cameco Corp., 83%, and AREVA Resources Canada Inc., 17%	Key Lake mill, Saskatchewan	(3)
Do. do.	Cameco Corp.	Rabbit Lake operations, includes Eagle Point underground mine and Rabbit Lake mill, Saskatchewan	5,500.
Do. do.	Joint venture of AREVA Resources Canada Inc., 70%; Denison Mines Inc., 22.5%; OURD Canada Company Ltd., 7.5%	McClean Lake Mine,[2, 4] Saskatchewan	NA.
Zeolite	Heemskirk Canada Ltd. (Heemskirk Consolidated Ltd.)	Bromley Creek (Princeton) Mine, near Copper Mountain, British Columbia	NA.
Do.	do.	Z1 (Ranchlands) quarry, near Cache Creek, British Columbia	NA.
Do.	Industrial Mineral Processors Ltd.	Z2 quarry, near Cache Creek, British Columbia	NA.
Do.	HCA Mountain Minerals (Lethbridge) Ltd. (Heemskirk Canada Ltd.)	Processing plant at Lethbridge, Alberta	NA.
Zinc:			
Lead-zinc ore	Maple Minerals Corp.	Caribou underground mine,[2] 45 kilometers west of Bathurst, New Brunswick	700.
Do.	NVI Mining Ltd. (Breakwater Resources Ltd.)	Myra Falls complex (Battle-Gap and H-W Mines), British Columbia	800.
Do.	ScoZinc Ltd. (Acadian Mining Corp.)	Scotia open pit mine,[2] Gays River, Nova Scotia	600.
Do.	Xstrata Zinc (Xstrata plc, 100%)	Brunswick Mine in Bathurst, New Brunswick	3,550.
Zinc ore	Agnico-Eagle Mines Ltd.	LaRonde Mine, 60 kilometers west of Val-d'Or, Quebec	NA.
Do.	Breakwater Resources Ltd.	Langlois Mine,[2] 213 kilometers northeast of Val-d'Or, Quebec	NA.
Do.	Hudson Bay Mining and Smelting Co., Ltd. (HudBay Minerals Inc., 100%)	777 and Trout Lake Mines, Flin Flon, Manitoba	2,300.
Do.	do.	Chisel North Mine, Snow Lake, Manitoba	330.
Do.	Teck Resources Ltd.	Duck Pond mine, 90 kilometers south of Buchans, Newfoundland and Labrador	500.
Do.	Xstrata Copper (Xstrata plc, 100%)	Kidd Creek underground mine, 25 kilometers north of Timmins, Ontario	2,350.

See footnotes at end of table.

TABLE 2—Continued
CANADA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Zinc—Continued:			
Refined	Canadian Electrolytic Zinc Ltd. (CEZinc) (Noranda Income Fund)	Hydrometallurgical plant at Salaberry-de-Valleyfield, Quebec	280.
Do.	Hudson Bay Mining and Smelting Co., Ltd. (HudBay Minerals Inc., 100%)	Smelter at Flin Flon, Manitoba	118.
Do.	Teck Resources Ltd.	Trail smelter and refinery complex, Trail, British Columbia	295.
Do.	Xstrata Zinc (Xstrata plc, 100%)	Zinc hydrometallurgical plant at Hoyle, Ontario	150.

Do., do., Ditto. NA Not available.

[1] Abbreviations used in this table for commodities include the following: Au—gold; Co—cobalt; Cu—copper; K_2O—potassium oxide; Mo—molybdenum; Nb—niobium; Ni—nickel, and TiO_2—titanium dioxide.

[2] Mine or facility closed or operations suspended (mine may be on care-and-maintenance status).

[3] Processes ore from McArthur River Mine.

[4] Sue B and Sue E pits were mined out in 2008. McClean Lake mill processing stockpiled ore.

TABLE 3
CANADA: RESERVES OF MAJOR MINERALS IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Coal (anthracite, bituminous, and lignite)		6,578,000
Copper		7,290
Gold	metric tons	918 [2]
Lead		451
Molybdenum		215
Natural gas	billion cubic meters	1,750
Nickel		3,301
Petroleum, crude	million barrels	33,200
Silver	metric tons	6,254
Uranium, U_3O_8		428 [3]
Zinc		4,250

[1] As of December 31, 2009. Sources: Canadian Reserves of selected major metal information bulletin, February 2011, Natural Resources Canada; BP Statistical Review of World Energy, June 2010.

[2] Excludes metal in placer deposits.

[3] Recoverable resources as of January 1, 2010.

The Mineral Industries of Central America

Belize, Costa Rica, El Salvador, Honduras, Nicaragua, and Panama

By Susan Wacaster

In 2010, Central American economies generally rebounded from the economic downturn of 2008-9 owing to increased external demand (primarily from the United States), some increased domestic demand, increased foreign direct investment (FDI), and increased remittance inflows in some countries. Panama led the region for the second consecutive year with a 6.3% increase in the gross domestic product (GDP) that was driven by public and private sector projects, including the expansion of the Panama Canal, development at Petaquilla Minerals Ltd. of Canada's Cobre Panama and Molejon properties, and continued hydroelectric projects. Mostly supported by increased exports, Costa Rica and Nicaragua registered GDP increases of 4.0% and 3.0%, respectively. The Honduran economy recorded growth of 2.5% in 2010 subsequent to a relative normalization of international relations that had been strained by a 2009 coup d'état. El Salvador's economy grew by 1.0%.

Construction activity decreased in all countries except Panama. Inflation increased in all countries in response to the increase in economic activity and higher costs of imports of petroleum and energy-based raw materials, as well as decreased food production in countries that were affected by storms and floods. Guatemala, Panama, and El Salvador reported inflation rates of 5.3%, 4.1%, and 3.2%, respectively. Interest rates declined in all countries. Costa Rica, El Salvador, and Nicaragua, however, reported a contraction in lending to the private sector whereas increases were recorded in Guatemala and Panama. External debt as a percentage of GDP in 2009 was highest in Belize at 76%, followed by Nicaragua, 56%; El Salvador, 46%; Costa Rica, 27%; Honduras, 23%; and Guatemala, 13%. A European Union Association agreement with Central America was signed in May, which was expected to boost future levels of trade and foreign investment in Central America (Central Bank of Belize, 2011, p. 10–12; Economic Commission for Latin America and the Caribbean, 2011, p. 165).

Employment in the mining sector of Central American countries accounted for only about 0.1% to 0.2% of the total urban employed population. In Latin America, the mining and quarrying sector contributed about 4.0% to the regional GDP (at constant 2000 prices) in 2008 (the most recent year for which data were available). In 2009, mining and quarrying exports from Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua contributed just 0.4% of the total GDP of all countries in Latin America (Economic Commission for Latin America and the Caribbean, 2011, p. 16, 43, 83). The mineral industry of Guatemala is discussed in a separate report.

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Economic Commission for Latin America and the Caribbean, 2011, Statistical yearbook for Latin America and the Caribbean 2010: Comision Economica Para America Latina y el Caribe, 310 p. (Accessed August 1, 2011, at http://www.eclac.org/cgi-bin/getProd.asp?xml=/deype/agrupadores_xml/aes250.xml&xsl=/agrupadores_xml/agrupa_listado.xsl.)

BELIZE

The year-on-year growth in the real GDP of Belize for 2010 was reported by the Central Bank of Belize to be 2.9% compared with zero growth in 2009. The manufacturing sector, however, recorded a 4.7% decrease, in part because of decreased petroleum output. The contribution of mining and quarrying to the GDP (at constant 2000 prices) was about 0.5% in 2008 (the most recent year for which data were available) and was expected to be less in 2010 because of decreased petroleum production and a cessation of production from the only gold-producing operation that had been active in the country in recent years. Inward FDI in 2009 (the most recent year for which data were available) decreased by 46% to about $55 million, of which the mining and quarrying sector received $2.5 million (Central Bank of Belize, 2011, p. 31).

Production

Data on mineral production are in table 1. Petroleum extraction in Belize had increased slightly each year since 2006, but in 2010, production decreased by about 6.0% to 1.5 million barrels (Mbbl). The reduction was attributed to downtime at one or more wells in the Spanish Lookout field (out of 11 total wells), as well as to the natural decline in output that takes place over the lifetime of an oilfield (Statistical Institute of Belize, 2010; Central Bank of Belize, 2011, p. 39).

Mineral Trade

In 2010, Belize's trade deficit shrank by 26.5% to about $179 million (12.4% of the GDP) following a 24.0% increase in exports and 4.7% increase in imports. Imports for domestic consumption decreased by 3.5% compared with those of 2009, although spending on manufactured goods, minerals, and fuels increased by an unspecified amount (Caribbean Community Secretariat, 2011).

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COSTA RICA

According to the Central Bank of Costa Rica, the year-on-year real GDP for 2010 increased by 4.2% compared with a decrease of 1.3% for 2009. The growth was primarily owing to activity in the agricultural and manufacturing sectors whereas the mining and quarrying and construction sectors together contracted by about 6.5%. Among all sectors, mining had been the sector of least importance to the national economy of Costa Rica since at least 1991, contributing less than 1% to the total GDP every year since that time. In 2010, the preliminary value of exports from Costa Rica was about $9.5 billion and that of imports was about $13.6 billion compared with $8.8 billion and $11.4 billion, respectively, in 2009. Costa Rica was not a significant trader of mineral commodities and there were no reported exports of mineral products. In 2010, the country imported $1.6 billion worth of hydrocarbon products, which was a 29% decrease compared with the value of these imports in 2009 (Banco Central de Costa Rica, 2011a; 2011b, p. 22–23, 29; 2011c).

Production

Data on mineral production are in table 1.

References Cited

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EL SALVADOR

During the period from 2001 through 2009, El Salvador's economy had the least growth among the countries of Central America at about 2.1%, which was about the same as the period from 2000 through 2004 but much less than most years since the 1950s except during periods of military conflict in the 1980s. In 2010, the Salvadoran economy grew by about 1.3%. The mineral industry continued to play a minor and diminishing role in terms of contribution to the GDP of the country. The estimated value of production from mines and quarries in 2010 (at constant 2000 prices) was $46.9 million, which accounted for 0.3% of the total GDP and was a 1.3% increase compared with the value in 2009. El Salvador was not a significant trader of mineral products (Banco Central de Reserva de El Salvador, 2010; Comisión Economica de America Latina y el Caribe, 2011).

Production

Data on mineral production are in table 1.

References Cited

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HONDURAS

In 2010, the Honduran year-on-year GDP growth rate (at current prices) increased by about 2.8% compared with a 2.1% decrease in 2009. The increase was owing to increased external demand from the other Central American countries, Europe, Mexico, and the United States; increased internal consumption; and increased investment. In 2010, production continued at Breakwater Resources Ltd. of Canada's El Mochito lead, silver, and zinc operation in the Department of Santa Barbara and Aura Minerals Inc. of Canada's San Andres gold operation in the Department of Copan. The estimated value of mining and quarrying increased by 7.8% in 2010 to about $115 million. Honduras was not a significant exporter of mineral products. In 2010, the total value of exports was $5.8 million, of which an estimated $108,000 was accounted for by the export of zinc products (Banco Central de Honduras, 2011, p. 12, 19, 70).

Production

Data on mineral production are in table 1. Gold production increased by 3% in 2010 compared with that of 2009 and production of lead concentrate increased by 17%.

Reference Cited

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NICARAGUA

The value of the Nicaraguan GDP (methodology not reported) decreased in 2010 by about 5% compared with that of 2009, and the contribution of the mineral sector to the GDP increased to 1% from a revised 0.7% in 2009. The value of output of metals and metallic products was $122.4 million in 2010 compared with $128.6 million in 2009, and the value of refined petroleum products was $384.6 million compared with $408 million in 2009. The value of FDI received by the mineral sector in 2010 was $25.3 million compared with $12.0 million in 2009 and accounted for 5% of the total FDI received for the year. The mining and quarrying sector employed about 10,900 people in 2010 compared with 5,700 in 2009. In 2010, a preliminary total of 3,464 people were employeed in the mining industry, of which 2,780 were associated with metallic metals mining. Nicaragua was not a significant exporter of mineral products. The country imported crude oil, fuels, and lubricants valued at $419.8 million and $355.6 million, respectively, in 2010 (Central Bank of Nicaragua, 2011, p. 6–8, 10, 13, 19; Minesterio de Energia y Minas, 2011).

The Limon gold mine in Leon Province and La Libertad gold mine in Chontales Province were acquired by B2 Gold Corp. of Canada in 2009. Limon was already a producing mine and La Libertad started up in the first quarter of 2010; both mines continued production throughout 2010. By September, B2 Gold had completed 7,200 meters (m) of drilling as part of a 14,800-m drill program at Limon. Initial results indicated potential for both open pit and underground operations. B2 Gold was planning a 19,000-m drill program at La Libertad in 2011 and expected to produce 9,800 kilograms (kg) of gold in 2011 (B2 Gold Corp., 2010, 2011).

Production

Data on mineral production are in table 1. Gold production increased by 89% in 2010 compared with that of 2009. In 2010, the Limon and La Libertad Mines produced about 2,130 kg of gold each.

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PANAMA

From 2006 through 2010, the Panamanian GDP increased to $21.3 billion from $15.5 billion. The contribution of mining and quarrying to the GDP increased only marginally in recent years to just 1.4% in 2010 from 1% in 2006. The value of mining and quarrying was $292 million in 2010 compared with a revised $275 million in 2009. Panama was not a significant exporter of mineral products. The total value of exports from Panama in 2010 was estimated to be $739 million and the total value of imports was estimated to be $9.3 billion. The country imported an estimated $790 million worth of petroleum refinery products (Instituto Nacional de Estadistica y Censo, 2011).

Production

Data on mineral production are in table 1. Petaquilla Minerals Ltd. of Canada started production of gold at the Molejon Mine in January. Production from the mine for the entire fiscal year was less than projected owing to a breakdown of two of three ball mills. Gold production in the third and fourth quarters of 2010 was about 870 kg (Petaquilla Minerals Ltd., 2010, p. 4–5).

References Cited

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TABLE 1

CENTRAL AMERICA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity		2006	2007	2008	2009	2010[e]
BELIZE						
Clays, unspecified[e]	thousand metric tons	428 [3]	400	400	400	400
Dolomite[e]		5,488 [3]	5,000	5,000	5,000	5,000
Gold, mine output, Au content	grams	5,040	8,300	18,200	-- [r]	--
Petroleum, crude[4]	thousand 42-gallon barrels	797	950	1,200	1,609	1,514 [3]
Quartz sand (silica)[e]	thousand cubic meters	11	12	12	12	12
Sand and gravel[e]	do.	219 [3]	200	200	200	200
Sand, including lime sand, river sand, silt, and mud[e]	do.	856 [3]	800	800	800	800
Stone, natural, limestone, including marl[e]	thousand metric tons	287 [3]	300	300	300	300
COSTA RICA						
Cement[e]	thousand metric tons	1,900 [3]	2,300 [3]	2,500	2,500	2,500
Clays, unspecified[e]		400,000	323,381 [3]	349,724 [3]	350,000	350,000
Diatomite		2,780	1,712	1,059	1,200 [e]	1,000
Gold, mine output, Au content	kilograms	1,210	1,036	198	150	--
Iron and steel, semimanufactures	thousand metric tons	736	659	657	319	400
Petroleum, refinery products	thousand 42-gallon barrels	4,920	--	--	--	--
Stone, sand and gravel:[e]						
Crushed rock and rough stone	thousand metric tons	10,400	9,260 [3]	10,000 [3]	10,000	10,000
Limestone and calcareous materials	do.	1,710 [3]	1,862 [3]	1,506 [3]	1,500	1,500
Sand and gravel	do.	3,750	3,438 [3]	4,348 [3]	3,500	3,500
Sandstone	do.	3,000	120 [3]	164 [3]	150	150
EL SALVADOR						
Cement, hydraulic[e]	thousand metric tons	1,311 [3]	1,300	1,300	1,212 [3]	1,200
Iron and steel, metal:						
Steel, crude		72,000	73,000	73,000	56,000	56,000
Semimanufactures		90,000	121,000	100,000	100,000 [e]	100,000
Limestone[e]	thousand metric tons	1,200	1,200	1,200	1,200 [r]	1,200
Petroleum, refinery products[e]	thousand 42-gallon barrels	6,180	6,180	6,200	6,200	6,200
HONDURAS						
Cement	thousand metric tons	1,668	1,776	1,784	1,800	1,800
Clays, unspecified[e]		14,000	14,000	14,000	14,000	14,000
Gold, mine output, Au content	kilograms	4,100	3,275	2,561	2,127	2,197 [3]
Lead, mine output, Pb content of concentrate		11,775	10,215	12,545	14,471	16,900 [3]
Limestone[e]	thousand metric tons	1,200	1,200	1,200	1,200	1,200
Salt[e]		40,000	40,000	40,000	40,000	40,000
Silver, mine output, Ag content of concentrate	kilograms	55,036	53,894	59,934	57,697	48,614 [3]
Zinc, mine output, Zn content of concentrate		37,646	29,211	28,462	36,370	36,370 [3]
NICARAGUA						
Cement[e]		530,000	530,000	530,000	530,000	530,000
Gold, mine output, Au content	kilograms	3,395	3,132 [r]	2,965 [r]	2,590 [r]	4,900 [3]
Gypsum and anhydrite, crude		42,190 [r]	43,320 [r]	49,930 [r]	37,400 [r]	20,330 [3]
Lime		2,350 [r]	3,619 [r]	3,643 [r]	3,127 [r]	2,065 [3]
Limestone, calcium carbonate, including for cement		1,133	1,321 [r]	1,020 [r]	783 [r]	1,083 [3]
Petroleum, refinery products	thousand 42-gallon barrels	5,595	5,586	4,925 [r]	5,694 [r]	5,500
Pumice, stone	cubic meters	510	910	270	150	950 [3]
Salt, marine[e]		30,000	30,000	30,000	30,000	30,000
Sand, unspecified	thousand cubic meters	435	290 [r]	250 [r]	144 [r]	174 [3]
Silver, mine output, Ag content	kilograms	2,929	3,417 [r]	3,440 [r]	4,492 [r]	6,995 [3]
Stone:						
Crushed	thousand cubic meters	695	591 [r]	871 [r]	722 [r]	7,445 [3]
Quarried, unspecified	thousand metric tons	7,272	7,479 [r]	7,011 [r]	6,932 [r]	7,452 [3]
Tuff, volcanic	do.	136	127 [r]	163 [r]	118 [r]	94 [3]

See footnotes at end of table.

TABLE 1—Continued
CENTRAL AMERICA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity		2006	2007	2008	2009	2010[e]
PANAMA						
Cement[e]	thousand cubic meters	1,050	1,050	1,843[3]	1,679[3]	1,700
Clays, for cement[e]	cubic meters	64,000	64,000	64,000	64,000	64,000
Gold, mine output, Au content	kilograms	--	--	--	800	870
Lime[e]		3,500	3,500	3,500	3,500	3,500
Salt, marine[e]		18,000	18,000	18,000	16,722[3]	17,000
Stone, sand and gravel:[e]						
Limestone	thousand metric tons	270	270	270	270	270
Sand and gravel	thousand cubic meters	1,200	1,200	1,200	1,200	1,200

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through August 10, 2011.

[2] In addition to the commodities listed, some additional construction materials are produced, but available information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] Assumes that all crude petroleum produced was exported.

TABLE 2
CENTRAL AMERICA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2010

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
BELIZE				
Dolomite		Belize Minerals Ltd. (Danish Development Bank and other private, 100%)	Punta Gorda, Toledo District	6,320
Limestone		Caribbean Investors Ltd. (private, 100%)	Georgeville, Cayo District	1,140
Petroleum	thousand 42-gallon barrels	Belize Natural Energy Ltd. (BNE) (Aspect Energy LLC and CHx LLC), 100%	Spanish Lookout, Cayo District, Blocks 5 and 5a	1,000
COSTA RICA				
Cement, limestone, including marl		Holcim Costa Rica S.A. (Holcim Ltd., 59.8%, and other private, 40.2%)	Cartago cement plant, Aguas Calientes	1,200
Do.		CEMEX Costa Rica S.A. (CEMEX S.A.B de C.V., 98.7%, and other private, 1.3%)	Colorado de Abangares cement plant, Guancaste Province, and Guatuso de Patarra cement grinding and bagging plant, San Jose	850
Clays		do.	Tajo Finca clay quarry, near city of Platanar	100
Limestone		do.	Cerro Pena Blanca limestone quarry, Guancaste Province	300
Do.		Holcim Costa Rica S.A. (Holcim Ltd., 59.8%, and other private, 40.2%)	La Chilena and three other quarries near Cartago cement plant, Cartago Province	650
Petroleum, refinery products	thousand 42-gallon barrels	Refinadora Costarricense de Petróleo S.A. (RECOPE S.A.) (Government, 100%)	Moin refinery, city of Limon, Limon Province	9,000
Steel, semimanufactures		Laminadora Costarricense S.A. (Mittal Steel Company N.V., 50%, and Grupo Pujol-Martí, 50%)	Rolling mill, steel manufacturing complex, Jimenez de Guapiles, Limon Province	400
Do.		Trefileria Colima S.A. (Mittal Steel Company N.V., 50%, and Grupo Pujol-Martí, 50%)	Wire-drawing unit, city of Jimenez de Guapiles, Limon Province	60

See footnotes at end of table.

TABLE 2—Continued
CENTRAL AMERICA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2010

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
EL SALVADOR				
Cement		Cemento de El Salvador S.A. de C.V. (Holcim Ltd., 64.25%, and other private, 35.75%)	El Ronco and Maya Plants, near Metapan, Santa Ana Department	1,900
Limestone		do.	Quarries near Aldea El Zapote and Santa Ana, Santa Ana Department	440
Petroleum, refinery products	thousand 42-gallon barrels	Refinería Petrolera Acajutla S.A. de C.V. (RASA de C.V.) (Exxon Mobil Corp., 65%, and Royal Dutch/Shell Group, 35%)	Puerto de Acajutla, Sonsonate Department	8,000
Steel:				
Crude		Corporación Industrial Centroamericana S.A. de C.V. (private, 100%)	Electric arc furnace, Quetzaltepeque, La Libertad Department	60
Semimanufactures		do.	Billet casting machine and rolling mill, Quetzaltepeque, La Libertad Department	92
HONDURAS				
Cement		Cementos del Norte S.A. de C.V. (Holcim Ltd., 24.2%, and Inversiones Continental S.A., 75.8%)	Rio Bijao plant, municipality of San Pedro Sula, Cortes Department	1,100
Do.		Lafarge Incehsa S.A. de C.V. (Lafarge Group, 52.8%, and other private, 47.2%)	Piedras Azules plant, municipality of Comayagua, Comayagua Department	1,300
Gold	kilograms	Aura Minerals Inc., 100%	San Andres Mine, municipality of La Union, Copan Department	2,300
Lead	metric tons	Compañia Minera Santa Bárbara (Breakwater Resources Ltd., 100%)	El Mochito Mine, municipality of Las Vegas, Santa Barbara Department, 88 kilometers southwest of San Pedro Sula	9,000
Silver	kilograms	do.	do.	50,000
Zinc	metric tons	do.	do.	42,000
NICARAGUA				
Cement		CEMEX Nicaragua S.A. (CEMEX S.A.B de C.V., 100%, but on lease from Government)	San Rafael del Sur plant, 45 kilometers from Managua, and milling plant in Managua	470
Cement, clinker		Holcim de Nicaragua S.A. (Holcim Ltd., 70%, and other private, 30%)	Nagarote grinding plant, San Rafael del Sur	350
Gold	kilograms	B2Gold Corp., 95%	El Limon Mine, Talavera deposit, 100 miles north of Managua	1,400
Do.	do.	B2Gold Corp., 100%	La Libertad, 110 kilometers east of Managua	540
Petroleum, refinery products	thousand 42-gallon barrels	Refinería Esso Managua S.A. (Exxon Mobil Corp., 100%)	Capital city of Managua; 40-mile pipeline to the refinery from Puerto Sandino	7,300
PANAMA				
Cement		Cemento Panamá S.A. (Cementos del Caribe S.A., 50%, and Holcim Ltd., 50%)	Grinding plant in Quebrancha, Panama Province	800
Do.		Cemento Bayano S.A. (CEMEX S.A.B de C.V., 99.3%, and other private, 0.7%)	Plant in Calzada Larga, Panama Province	450
Gold	kilograms	Petaquilla Minerals Ltd., 100%	Molejon Mine, Panama Province	1,500

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

THE MINERAL INDUSTRY OF CHILE

By Steven T. Anderson

Chile's position in the world mineral economy was as a leading supplier of many minerals in crude form, especially metals associated with the mining of copper and industrial minerals (such as lithium carbonate and potash) obtained from mining the salars and arid areas in the country. At the end of 2009, the country was estimated to have the leading reserves of copper, lithium, rhenium, and selenium (tied with Russia) in the world; the second ranked reserves of iodine and silver; and the third ranked reserves of molybdenum. Chile was also estimated to have globally significant (equal to or greater than 5% of the world total) reserves of gold, and a substantial proportion of the gold and silver reserves were associated with the copper reserves at some of the major porphyry copper deposits in the country. Chile was estimated to have accounted for less than 2% of global potash reserves (Servicio Nacional de Geología y Minería, 2010, p. 14–16, 47–55; Brooks, 2011b; Edelstein, 2011; George, 2011a, b; Jasinski, 2011; Jaskula, 2011; Polyak, 2011a, b).

In 2010, Chile remained the world's leading producer of copper, accounting for 34% of world mine production; iodine (60%[1] of world mine production); rhenium (52%); and lithium (mostly in the form of lithium carbonate) (35%[1]). The country was estimated to have been the world's second ranked producer of arsenic (accounting for an estimated 21% of world production) and (total) refined copper (17%), and the third ranked producer of mined boron (ulexite) (19%[1]) and molybdenum (about 15%). It was the world's fifth ranked producer of silver (6% of world mine output), and the sixth ranked producer of pumicite (5%) and refined selenium (3%[1]). Chile was estimated to have accounted for about 2% the world's mine output of diatomite, gold, potash (K_2O content), and salt (NaCl), and for about 2% of global production of sulfur (Angulo, 2011a, b; Apodaca, 2011; Brooks, 2011a; Comisión Chilena del Cobre, 2011, p. 136–137, 140–141, 143–145; Crangle, 2011a, b; George, 2011b; Jasinski, 2011; Jaskula, 2011; Kostick, 2011; Polyak, 2011b).

Minerals in the National Economy

In 2010, total mine production accounted for about 19.2% ($39 billion[2]) of the country's gross domestic product (GDP) compared with 15.6% ($25 billion) in 2009, and copper mine production was valued at about $35 billion compared with about $22 billion in 2009. In real terms,[3] the total value of mine production increased by about 1.2% compared with that of 2009, mostly owing to an increase of about 1.7% in the real value of the country's copper mine production; the real value of all noncopper mine production decreased by about 1% during the same timeframe (Banco Central de Chile, 2011a, p. 40–41, 44–46; Comisión Chilena del Cobre, 2011, p. 68–69; International Monetary Fund, 2011).

The mineral trade balance of Chile (including crude petroleum and natural gas) increased to about $30 billion compared with $19.8 billion in 2009. The value of the country's exports of nonfuel mineral products (the leading mineral export sector) increased to $46 billion from $31.4 billion in 2009, and the value of the country's imports of mineral fuels and related materials (the leading mineral import sector) increased to $11.4 billion from $9 billion in 2009 (Banco Central de Chile, 2011b, p. 31, 61).

At current prices, labor costs in the mineral industry continued to increase during 2010. The total wage bill for all mining and the extraction of crude petroleum increased to $3.12 billion compared with about $2.67 billion in 2009. In 2010, mining and the extraction of crude petroleum employed 66,063 workers compared with 62,102 workers in 2009 and 64,268 in 2008. Workers directly employed in mining and the extraction of crude petroleum accounted for only about 1% of all employees in Chile, but this figure does not include the large number of workers who provided necessary services for these mineral extraction sectors (such as administrative, consulting, legal, marketing, security, and transportation services), those who were employed in domestically producing downstream mineral-based products from the raw minerals extracted in Chile, and those whose jobs otherwise critically depended on the extraction of minerals in the country (Servicio Nacional de Geología y Minería, 2010, p. 17–18; 2011, p. 17–18; Comisión Chilena del Cobre, 2011, p. 73).

Government Policies and Programs

On October 13, 2010, the Government approved additional taxes on mining companies and other corporations to help with reconstruction following an earthquake in northern Chile on February 27. These new taxes were expected to be phased in starting in 2011. On June 16, 2005, the Government had approved Law 20.026 to establish a mining-specific tax (royalty), which modified both the applicable Mining Code (approved on September 26, 1983) and the 1974 foreign investment statute, known as Decree Law 600 (D.L. 600). The tax, which is assessed on a per-company basis, took effect at the beginning of 2006 and applies only if the total value of mine production by a single company exceeds the average value of 12,000 metric tons (t) of copper during the year. The royalty rates that mining companies were estimated to be paying in 2010 was between 4% and 5%, and the new taxes to help fund earthquake reconstruction projects could expand the effective royalties rate on mining companies to between 4% and 9%.

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[1] Excludes production by the United States.

[2] Where necessary, nominal values have been converted from Chilean pesos (Ch$) to U.S. dollars (US$) at an annual average exchange rate of Ch$559.61=US$1.00 for 2009 and about Ch$510.23=US$1.00 for 2010. All values are nominal, at current prices, unless otherwise stated.

[3] Real values are adjusted for inflation using constant 2003 prices.

Before passage of the mining-specific tax law in 2005, the most recent significant modifications of the Mining Code had been through approval of a Mining Safety Act on December 30, 2002. The main environmental law was Decree Law 19.300, which was approved on March 9, 1994, and was supplemented on December 7, 2002, by approval of Decreto Supremo 95, which is a Government decree that requires environmental impact statements for any new investment projects that involve either exploration for or extraction of the country's natural resources (including minerals). Decreto Supremo 95 is the primary statute for environmental regulation of mining concessions in Chile (Rojas and others, 2006, p. 360–362; Biblioteca del Congreso Nacional de Chile, 2008; Economist, The, 2010a, b; Henriquez, 2010; CAP S.A., 2011, p. 2).

In 2006, the Government passed the Fiscal Responsibility Law (FRL) that created two funds to manage increased revenues from mining royalty payments and from the state-owned mining company Corporación Nacional del Cobre (CODELCO). The FRL extends the commitment of the Government to a structural fiscal surplus rule that was established in 2000 to help insulate the economy from fluctuations in mineral commodity prices. During a boom period (as during 2007), this rule allows the Government to spend only the portion of the surplus revenue that is considered permanent and to save the transitory portion. (Transitory Government surpluses from the copper sector have been termed "copper windfall revenues.") As part of the FRL, a panel of six members was selected to form a financial advisory council to advise the Minister of Finance concerning investment guidelines and other matters related to the two funds, including helping to determine what portion of the surplus mining revenues was permanent and what portion was transitory. The first fund is called the Economic and Social Stabilization Fund (ESSF) and was established with an initial investment of about $6 billion in 2006, mostly from the closure of the old Copper Stabilization Fund (established in 1985); the second fund is called the Pension Reserve Fund and was established with an initial investment of $600 million. At the end of 2010, the two funds contained about $12.7 billion and $3.84 billion in assets, respectively, compared with $11.3 billion and $3.42 billion, respectively, at yearend 2009 (International Monetary Fund, 2009, p. 60; Kumhof and Laxton, 2009, p. 25; Ministerio de Hacienda, 2011, p. 10).

The Chilean Government, through the Ministerio de Minería, exercises control of the mineral industry through three state-owned companies and four regulatory agencies. The state-owned companies that are significant to the mineral industry include CODELCO, some subsidiaries of Corporación de Fomento de la Producción (CORFO), and Empresa Nacional de Minería (ENAMI). The specific subsidiaries of CORFO that are significant to the mineral industry include Cía. Chilena de Electricidad S.A., Empresa Nacional del Carbón S.A. (ENACAR), and Empresa Nacional del Petróleo S.A. (ENAP). The four regulatory agencies are Comisión Chilena del Cobre (COCHILCO), the Comisión Nacional del Medio Ambiente (CONAMA), Comité de Inversiones Extranjeras (CIE), and the Servicio Nacional de Geología y Minería (SERNAGEOMIN).

Production

In 2010, the Fe content of iron ore production increased by 17% compared with that of 2009, but production of pig iron and crude steel decreased by 31% and 23%, respectively, during the same timeframe. This was because the earthquake caused CAP S.A. of Chile to suspend production of pig iron and crude steel for about 4 months, but production of iron ore by Compañía Minera del Pacífico S.A. (CMP) (a 100%-owned subsidiary of CAP) was basically unaffected. On May 25, 2009, CMP suspended production of manganese ore and concentrates by Manganesos Atacama S.A. (MASA) (another subsidiary of CAP) owing to insufficient demand, and MASA did not produce any manganese through the end of 2010 (table 1; Business News Americas Ltda., 2010; CAP S.A., 2011, p. 2–3, 9, 17–19; Compañía Minera del Pacífico S.A., 2011, p. 15, 50; Servicio Nacional de Geología y Minería, 2011, p. 41).

Despite an increase of about 24% in the average price of lead in 2010 compared with that of 2009, production of mined lead in Chile decreased by 54% during this timeframe. This was mostly owing to a labor strike at Breakwater Resources Ltd. of Canada's El Toqui Mine, which caused the company to modify the mining sequence to produce more gold and silver in concentrates and less lead and zinc in concentrates than initially planned for 2010. Molibdenos y Metales S.A. (MOLYMET) did not decrease production of rhenium much (if at all) in 2010, although a fire at the company's Nos plant in September 2009 had been expected to affect the company's future production of rhenium significantly. Information was not available concerning the reasons for the 23% decrease in the production of silver granules at the noble metals plant at CODELCO's Ventanas smelting and refining complex nor the 17.5% decrease in production of molybdenum oxides by the company's CODELCO Norte Division (table 1; Breakwater Resources Ltd., 2011, p. 1, 6, 21–23; Molibdenos y Metales S.A., 2011, p. 39, 51; Servicio Nacional de Geología y Minería, 2011, p. 31, 41, 59).

In 2010, production of clays (which included ball and plastic clays) and bentonite increased by 31% and about 29%, respectively, compared with that of 2009. Production of refractory or bauxitic clays decreased by 57% during the same timeframe, likely owing to a decrease in domestic demand for refractory materials (bricks) made from bauxitic clays for use in the production of crude steel. After producing only slightly more than 1,000 t of phosphorite in 2009, Compañía Minera de Fosfatos Naturales Ltda. increased production to substantially more than 40,000 t of phosphorite in 2010. Information concerning a reason for the company's increase in phosphorite production was not available, however, and neither was information available to explain why Chile's production of guano and apatite decreased by about 49% and 15%, respectively, during the same timeframe (table 1; Servicio Nacional de Geología y Minería, 2010, p. 85–90, 119–121, 152–153; 2011, p. 65–70; 99–101, 132–133).

Chile's total production of potash (K_2O equivalent) increased by about 40% compared with that of 2009 mostly owing to Sociedad Química y Minera de Chile S.A. (SQM)'s continued expansion of the company's production of potassium-based products in the Salar de Atacama. As part of SQM's expansion of potassium chloride (KCl) production capacity in 2009, SQM converted the company's potassium sulfate (K_2SO_4) production facilities to be of dual-use, with a capacity to produce more KCl in exchange for producing less K_2SO_4. In 2010, the company used this new flexibility to produce more KCl and less K_2SO_4, and this decision was primarily responsible for the precipitous decrease in Chile's production of potassium sulfate compared with that of 2009. In 2010, SQM increased its production of lithium carbonate to about 26,000 t compared with about 14,000 t in 2009 owing to the company's expectation of an increase in global demand (mostly based upon an expected increase in demand for lithium for use in rechargeable batteries). The other major producer of lithium products from the brines of the Salar de Atacama appeared to have increased production of lithium carbonate by about 7,000 t during this same timeframe (tables 1, 2; Sociedad Química y Minera de Chile S.A., 2010, p. 15, 17-18, 23, 31-32; 2011, p. 5, 15–17, 24, 27, 29–31, 34–35, 45).

Structure of the Mineral Industry

In 2010, many of the world's leading private mining companies were deeply invested in the mining sector of Chile. These companies included Anglo American plc and Antofagasta plc of the United Kingdom, Barrick Gold Corp. and Teck Cominco Ltd. of Canada, BHP Billiton Ltd. and BHP Billiton plc of Australia and the United Kingdom (BHP Billiton), Freeport-McMoRan Copper & Gold Inc. of the United States, K+S Aktiengesellschaft (K+S AG) of Germany, Rio Tinto Ltd. and Rio Tinto plc of Australia and the United Kingdom (Rio Tinto), and Xstrata plc of Switzerland (table 2).

The leading Chilean-owned companies in the mineral industry were CAP, CODELCO, MOLYMET, and SQM; CAP, MOLYMET and SQM were privately owned. CAP controlled most of the production of ferrous metals in the country; state-owned CODELCO was the leading copper mining company in the world; SQM was reportedly the leading integrated producer of iodine, lithium carbonate, and natural potassium nitrate in the world; and MOLYMET was the world's leading producer of rhenium (table 2; CAP S.A., 2011, p. 6–9, 51–52; Corporación Nacional del Cobre, 2011, p. 24; Molibdenos y Metales S.A., 2011, p. 9–10, 37, 85; Sociedad Química y Minera de Chile S.A., 2011, p. 17–20, 24–26).

Commodity Review

Metals

Copper.—BHP Billiton reported that the Escondida Mine would be able to produce at a rate of about 1.3 million metric tons per year (Mt/yr) of fine copper by sometime during the second half of 2014 or the first half of 2015 compared with the slightly less than 1.1 million metric tons (Mt) produced in 2010. BHP Billiton also reported that Minera Escondida Ltda. (which was 57.5% owned by BHP Billiton) planned to complete a crusher and conveyor system relocation project to access higher grade ore at the Escondida Mine by the end of 2012. This expansion, combined with completion of a debottlenecking project to provide additional copper ore processing capacity at the Laguna Seca concentration plant, could enable increased production of copper in concentrates at Escondida by the end of 2013 or sometime in 2014. Anglo American expected to increase the production capacity at Los Bronces Mine to about 400,000 metric tons per year (t/yr) of copper in concentrates by 2012 compared with an estimated 250,000 t/yr in 2010. Antofagasta projected that its new Esperanza Mine could produce about 160,000 t of payable copper in 2012 and possibly up to about 180,000 t of copper in 2013 (table 2; Anglo American plc, 2011, p. 18–19; BHP Billiton Ltd., 2011, p. 37–39, 43, 68, 135, 143, 153, 234; Antofagasta plc, 2012; Bourke, 2012).

In 2010, CODELCO approved construction of the Ministro Hales Mine near the Chuquicamata Mine in northern Chile and projected that construction would be completed by the end of 2013 and that mining could begin by sometime in 2014. The new mine was expected to eventually be able to produce about 160,000 t/yr of copper and about 300 t/yr of silver. During 2010, the company also continued with a feasibility study of converting the Chuquicamata Mine to an underground mining operation. A definitive timeline for beginning of construction of the new underground mine was not available, but the current open pit operation could stop being profitable sometime before 2020. After the conversion to an underground operation, the company estimated that the Chuquicamata Mine could produce about 340,000 t/yr of copper and 18,000 t/yr of molybdenum (Corporación Nacional del Cobre, 2011, p. 41–46; Vidal, 2011, p. 5).

Iron Ore and Manganese.—After decreasing production of iron ore in response to decreased demand both domestically and globally in 2009, CMP was able to increase production and exports of iron ore as the average price of all of the company's products more than doubled in 2010 compared with that of 2009. CMP expected that MASA would be able to fill any outstanding orders from stockpiles through 2011 (table 1; CAP S.A., 2011, p. 2–3, 9, 17–19; Compañía Minera del Pacífico S.A., 2011, p. 15, 50; Servicio Nacional de Geología y Minería, 2011, p. 41).

Industrial Minerals

Lithium and Potash.—Chile's globally significant production of industrial minerals was highly dependent on the mining of the brine deposits and caliche ores contained in the salars and arid areas, respectively, in the northern part of the country. In 2010, SQM reportedly increased its production of potash based mostly on expectations that prices for potassium-based fertilizers would consolidate at higher levels in 2010 or 2011 after resolution of issues with the completion of supply contracts between the world's major producers and significant consumers (especially in China). The brines of the Salar de Atacama were reported to contain significant concentrations of lithium as well as potassium, and SQM and one other company accounted for almost all (if not all) of the production of lithium carbonate from those brines (tables 1, 2; Sociedad Química y Minera de Chile S.A., 2011, p. 5, 15–17, 24, 27, 29–31, 34–35, 45).

Outlook

In a mining survey conducted by Business News Americas Ltda. between October and early December 2011, 45% of survey respondents said that Chile had the best investment climate in Latin America for mining investment. The Fraser Institute's ranking of Chile as a desirable destination for investment by private companies in the mining and quarrying sector was 8th out of 79 jurisdictions worldwide in 2011 compared with 7th out of 72 jurisdictions in 2010. Chile was the only jurisdiction outside of North America that consistently ranked among the top 10 for mining investment in the Fraser Institute's mining survey. Uncertainty owing to labor negotiations, changing tax regimes, uncertainty in output prices, accidents, equipment failures, or even natural hazard incidents (such as earthquakes) is ever present and could affect many of the projected timelines for mining projects or companies' production plans at existing mineral production facilities. Especially for new mining projects that do not yet have a completed feasibility study or do not expect to begin production until 4 to 5 years after an announced timeline, uncertainty can lead to delays in the actual start of production until years after the initially announced startup date (McMahon and Cervantes, 2011, p. 6, 9, 12; Vidal, 2011, p. 3–9; Business News Americas Ltda., 2012).

According to preliminary figures for 2011, it has been estimated that production of cement could have increased to 4.4 Mt; mined gold, to 45 t; iodine, to about 17,500 t; lithium carbonate, to about 55,000 t; molybdenum, to 42,000 t; potash, to about 1.6 Mt (of combined production of potassium chloride and potassium sulfate); and mined silver, to about 1,300 t compared with production in 2010. Production of boron compounds could have decreased to an estimated 480,000 t; mined copper, to about 5.25 Mt; and rhenium, to an estimated 24,000 kilograms compared with production in 2010. Chile's production of mined copper could increase to about 5.6 Mt in 2012 (mostly owing to the expansion at Los Bronces Mine and continued ramping up of production at the Esperanza Mine), 5.7 Mt in 2013 (mostly owing to the continued ramping up of production at ongoing expansions of existing mines and newer mines), and possibly about 5.9 Mt in 2014 (mostly owing to the completion of expansions at the Escondida Mine, and assuming that production at existing mines does not decrease substantially during the next 2 years) (Sociedad Química y Minera de Chile S.A., 2011, p. 5, 15–17, 24, 27, 29–31, 34–35, 45; Vidal, 2011, p. 10–16; Garay and others, 2012, p. 11).

Production of lithium, molybdenum, and potash could increase a bit more above projected 2011 levels, but further increases would probably only be incremental until definitive timelines are established for more major expansion projects or new mines to produce these minerals. Current Chilean law reportedly limits production of lithium in the Salar de Atacama by Sociedad Chilena del Litio Ltda. to no more than 200,000 t/yr of Li content and by SQM Salar S.A. to no more than 180,000 t/yr of lithium (owing to a classification of lithium as a strategic mineral in Chile), but neither company appears likely to approach either of these legal production limits in the next few years. In 2012 and beyond, production of rhenium could remain at about 24,000 kilograms per year or less because MOLYMET expected that its rhenium production levels could be limited by decreasing rhenium content in the (molybdenum) concentrates that the company processes (Azzopardi, 2010; Moores, 2010).

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TABLE 1
CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010
METALS						
Arsenic trioxide[e, 3]		11,000	11,000	10,000	11,000	11,000
Copper:						
Mine output, Cu content[4]	thousand metric tons	5,361	5,557	5,328	5,394[r]	5,419
Metal:						
Smelter, primary	do.	1,565	1,514	1,369	1,522	1,560
Refined:						
Electrowon	do.	1,692	1,832	1,971	2,118[r]	2,089
Primary, other	do.	1,119	1,105	1,087	1,159	1,155
Total	do.	2,811	2,937	3,058	3,277[r]	3,244
Gold, mine output, Au content	kilograms	42,100	41,527	39,162	40,834	39,494
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	8,628	8,818	9,316	8,242	9,130
Fe content	do.	5,235	5,379	5,670	5,006	5,852
Metal:						
Pig iron	do.	1,115	1,147	1,109[r]	923[r]	635
Ferroalloys:[e, 5]						
Ferrochromium		84	193	54	11	--
Ferromolybdenum		14,000	14,800	16,900	10,800	12,500
Steel, crude	thousand metric tons	1,627	1,679	1,523	1,308[r]	1,011
Semimanufactures	do.	1,520	1,607	1,573	1,286[r]	896
Lead, mine output, Pb content		672	1,305	3,985	1,511	695
Manganese ore and concentrate:						
Gross weight		37,169	26,808	18,273	5,722	--
Mn content		9,771	7,287	5,096	1,642	--
Molybdenum, mine output, Mo content		43,278	44,912	33,687	34,925	37,186
Of which, oxides[6]		7,197	7,244	5,662	7,134	5,885
Rhenium, mine output, Re content[e, 7]	kilograms	19,800	22,900	27,600	25,000	25,000
Selenium[e]	do.	74,000	70,000	78,000	90,000	90,000
Silver:						
Mine output, Ag content		1,607	1,936	1,405	1,301	1,287
Metal, Ag content[8]	kilograms	150,952	141,071	161,992	195,375	150,060
Zinc, mine output, Zn content		36,238	36,453	40,519	27,801	27,662
INDUSTRIAL MINERALS						
Barite		375	77	--	--	--
Boron compounds:						
Boric acid (H_3BO_3)		8,446	7,143	7,525	5,214	--
Ulexite, natural		459,645	527,929	583,474	607,921	503,609
Total		468,091	535,072	590,999	613,135	503,609
Cement, hydraulic	thousand metric tons	4,112	4,440	4,622	3,876	3,871
Clays:						
Bentonite		--	533	--	--	--
Kaolin		44,642	87,901	63,526	48,354	62,226
Refractory (bauxitic)		34,594	24,434	60,022	69,634	29,832
Other, including ball and plastic clays		84,846	97,189	23,197	6,076	7,972
Total		164,082	210,057	146,745	124,064	100,030
Copper sulfate		5,124	10,217	12,971	11,860	12,023
Diatomite		19,104	25,405	25,497	23,027	30,925
Dolomite		24,006	13,791	14,263	--	--
Feldspar		5,847	6,704	17,834	9,079	7,723
Gypsum:						
Crude	thousand metric tons	845	773	774	724	758
Calcined	do.	197	200	197	196	184
Iodine, elemental		16,494	15,473	15,503	17,399	15,793
Lime, hydraulic[e]	thousand metric tons	820	840	820	790	790

See footnotes at end of table.

TABLE 1—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010
INDUSTRIAL MINERALS—Continued						
Lithium compounds, natural:						
Lithium carbonate		46,241	51,292	48,469	25,154	44,025
Lithium chloride		1,166	4,185	4,362	2,397	3,725
Lithium hydroxide		3,794	4,160	4,050	2,987	5,101
Nitrates, crude, natural	thousand metric tons	1,112	1,160	1,158	1,049	1,059
Phosphatic materials, natural:						
Phosphate rock (apatite):						
Gross weight		12,236	12,910	21,306	10,584	9,019
P_2O_5 content[e]		3,770	3,980	6,570	3,260	2,780
Phosphorite		1,600	12,163	16,988	1,059	40,664
Guano		--	--	2,892	1,649	845
Potash, natural:						
Potassium chloride, KCl		647,449	690,692	753,995	942,309	1,523,222
Of which, K_2O equivalent[9]		409,000	436,300	476,300	595,300	962,200
Potassium sulfate, K_2SO_4		170,406	155,853	163,096	188,643	2,774
Of which, K_2O equivalent[e, 10]		87,000	79,000	83,000	96,000	1,400
Pumicite	thousand metric tons	1,423	1,136	1,063	919	824
Pyrophyllite		1,257	1,340	1,147	412	1,126
Salt (NaCl)	thousand metric tons	4,580	4,404	6,431	8,382	7,695
Siliceous sand and gravel (silica):						
Quartz, unspecified	do.	444	520	536	601	502
Silica sand	do.	638	713	865	803	825
Total	do.	1,081	1,234	1,401	1,405	1,326
Sodium compounds, n.e.s., sulfate[11, 12]		100 [e]	100 [e]	128	112	60
Stone:						
Limestone, calcium carbonate	thousand metric tons	7,145	7,196	7,295	6,012	6,518
Of which:						
Coquina	do.	330	392	420	297	329
Ground calcium carbonate, white	do.	16	15	34	46	48
Lapis lazuli		400	72	5	215	--
Marble		169	204	187	1,582	2,170
Travertine		12,020	14,805	11,413	5,473	4,015
Sulfur, byproduct[13]	thousand metric tons	1,641	1,559 [r]	1,573	1,653 [r]	1,676
Talc		704	764	961	790	238
Zeolites		298 [r]	280 [r]	140 [r]	--	--
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous and lignite, marketable	thousand metric tons	674	288	534	636	619
Coke, coke oven[e]	do.	560	580	520	450	350
Methanol	do.	3,186	1,841	1,088	942	935
Natural gas liquids:[e]						
Natural gasoline	thousand 42-gallon barrels	NA [r]	NA [r]	NA [r]	NA [r]	NA
Liquefied natural gas	do.	-- [r]	-- [r]	-- [r]	-- [r]	--
Total	do.	NA [r]	NA [r]	NA [r]	NA [r]	NA
Natural gas, marketable	million cubic meters	2,199	2,015	1,828	1,889	1,793
Petroleum:						
Crude and condensate[14]	thousand 42-gallon barrels	1,061	931	966	1,355	1,536
Refinery products:[15]						
Liquefied petroleum gas	do.	8,623	8,246	7,674	8,560	7,787
Gasoline, including for aviation	do.	21,668	18,725	21,687	21,121	17,549
Kerosene, including for jet fuel	do.	5,548	4,862	4,573	5,271	4,994
Diesel and distillate fuel oil	do.	25,600	24,040	27,549	25,751	21,738
Residual fuel oil	do.	17,523	16,310	12,756	11,177	9,202
Other, including asphalt, ethylene, naphtha, propylene, solvents, and so forth	do.	9,108	10,032	8,334	7,875	5,862
Total	do.	88,070	82,215	82,573	79,755	67,131

See footnotes at end of table.

TABLE 1—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

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[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. NA Not available. -- Zero.

[1] Table includes data available through January 27, 2012.

[2] In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output.

[3] Estimated arsenic trioxide equivalent of possible arsenic-containing residues and smelter dusts that might be recovered from nonferrous metals plants in Chile, although these residual materials may not have been processed to recover commercial-grade arsenic trioxide.

[4] Figures are the nonduplicate copper content of ore concentrates, blister, and refined copper measured at the last stage of commercial production, as reported by Comisión Chilena del Cobre (COCHILCO). Mine production reported by Servicio Nacional de Geología y Minería (SERNAGEOMIN) for the same years was only slightly higher (0.01% to 0.95%).

[5] Estimated from reported net exports.

[6] Production of molybdenum oxide only from the CODELCO Norte Division of Corporación Nacional del Cobre de Chile (CODELCO).

[7] Rhenium content of mine output in Chile was estimated based on information from COCHILCO.

[8] Production of refined silver metal (granular) only from the Ventanas smelter and refinery.

[9] Based on 63.17% potassium oxide equivalent for potassium chloride (sylvite) in Chile, as reported by SERNAGEOMIN, and rounded to four significant digits.

[10] Based on an assumed 51% potassium oxide equivalent for potassium sulfate, according to a minimum global average estimate and rounded to two significant digits. Source: Jasinski, S.M., 2011, Potash, *in* Metals and minerals: U.S. Geological Survey Minerals Yearbook 2009, v. I, p. 58.1–58.9.

[11] Not elsewhere specified.

[12] Includes production of natural sodium sulfate and anhydrous sodium sulfate, which are coproducts of the nitrate industry (salitre).

[13] Sulfur content of sulfuric acid as a byproduct of metallurgy and processing of mineral fuels, as reported by COCHILCO.

[14] Includes natural gasoline.

[15] Includes production from both imported and domestic petroleum, as reported by Empresa Nacional del Petróleo (ENAP).

TABLE 2

CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Barite metric tons	Sociedad Minera Godoy Schwenger y Cía.	La Calera, Region V	400
Bentonite do.	Sociedad Legal Minera Mabel Dos Primera de Arica	Quarry and plant near Arica, Region XV	1,500
Boron compounds, B_2O_3 content	Química Industrial del Bórax Ltda. (private, Chile-based investors, 100%)	Ulexite mine at Salar del Surire; and boric acid and agrochemical plants near Arica, Region XV	550
Do.	S.Q.M. Boratos S.C.M. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Mine brines of Atacama Salar, and boric acid plant at Antofagasta, Region II	200
Do.	S.Q.M. Salar S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Plant in Santiago Metropolitan Region	NA
Calcium carbonate, natural	Minera El Way S.A. (Cementos Bío Bío S.A., 100%)	Quarry near Antofagasta, Region II	NA
Do.	Minera El Jilguero S.A. (Cementos Bío Bío S.A., 100%)	Quarry near Copiapo, Region III	NA
Do.	Minera Río Teno S.A. (Cementos Bío Bío S.A., 100%)	Quarry and plant at Teno, near Curico, Region VII	NA
Do.	Minera Río Colorado S.A (Cementos Bío Bío S.A., 51%, and Soprocal Calerías e Industrias S.A., 49%)	La Perla Mine and plant near Melipilla, Santiago Metropolitan Region	NA
Do.	Sociedad Minera Las Abuelitas Ltda. (Soprocal Calerías e Industrias S.A., 100%)	Mine and plant near Melipilla, Santiago Metropolitan Region	NA
Do.	Minera Melón S.A. (Melón S.A., 100%)	Navío Mine near Quillota, Region V	NA
Do.	Alfredo Villalobos Román Tarsicio S.A.	Quarry and plant near Illapel, Region IV	NA
Do.	César B. Formas Ortiz S.A.	Plant at Chañaral, Region III	NA
Do.	Explotaciones de Minas Tongoy Ltda.	Quarry and plant near Tongoy, Region IV	NA
Do.	Imopac Ltda.	Plant at Vallenar, Region III	NA
Do.	Mario Alberto Pizarro A. S.A.	Plant at Los Vilos, Region IV	NA
Do.	Minera Trucco Ltda.	Mine and plant, Santiago Metropolitan Region	NA
Do.	Cristalerías Toro S.A.I.C.	Plant at Santiago, Santiago Metropolitan Region	NA
Do.	Sociedad Minera Godoy Schwenger y Cía.	Mine and plant near Quillota, Region V	NA
Do.	Compañía Minera Feltre Ltda.	Plant at Santiago, Santiago Metropolitan Region	NA
Do.	Compañía Minera Saturno Ltda.	do.	NA
Do.	Unimin Chile Ltda.	do.	NA
Do.	Sociedad Minera y Comercial Alegría y Cia Ltda.	Mine and plant at Coquimbo, Region IV	NA
Do.	Sociedad Contractual Minera Pirineos	Quarry and plant at Vallenar, Region III	NA
Do.	Cemento Polpaico S.A. (Holcim Ltd., 54.3%; Compañia de Consumidores de Gas de Santiago, 40.9%; other, 4.8%)	Cerro Blanco plant, Santiago Metropolitan Region; Mejillones plant, Region II; Coronel plant, Region VIII	NA
Cement	do.	do.	2,700[1]
Do.	Melón S.A. (Inversiones Brescia S.A., 99.24%, and other private, 0.76%)	La Calera plant, Region V, and grinding plant at Puerto Montt, Region X	1,800[1]
Do.	Cementos Bío Bío S.A. (private, 100%)	Talcahuano Plant, Region VIII	750[1]
Do.	do.	Grinding plant at San Antonio, Region V	300[1]
Do.	Industria Nacional de Cemento S.A. (INACESA), 100%	Plant near Antofagasta City, Region II	500[1]
Do.	do.	Plant near Curico City, Region VII	1,700[1]
Clays, unspecified	Sociedad Minera Casablanca S.A.	Quarry and plant in Santiago Metropolitan Region	NA
Do.	Sociedad Minera Godoy Schwenger y Cía.	Quarry and plant near Quillota, Region V	NA
Do.	Minera Lealtad Ltda.	Quarry and plant at Til Til, Santiago Metropolitan Region, and at Olmue, Region V	NA
Coal, bituminous and lignite	Empresa Nacional del Carbón S.A. (ENACAR)	Trongol Mine near Curanilahue, and plant at Lota, Region VIII	NA
Do.	Carbonífera Victoria de Lebu S.A. (Empresa Nacional del Carbón S.A., 100%)	La Fortuna de Lebu Mine near Lebu, Region VIII	150
Do.	Ingeniería del Sur S.A.	Bish Mine and possibly other active mines, Pecket deposit, Magallanes coal basin, Region XII	600
Copper, Cu content	Minera Escondida Ltda. (BHP Billiton plc, 57.5%; Rio Tinto plc, 30%; Japan Escondida Corp., 10%; International Finance Corp., 2.5%)	Escondida open pit mine, two concentrator plants, an oxide plant for cathode production (SX-EW[2]), and a sulfide-leach plant for cathode production, Region II	1,200
Do.	Minera Spence S.A. (BHP Billiton plc, 100%)	Spence Mine and SX-EW[2] plant, Region II	200[1]
Do.	Compañía Minera Cerro Colorado (BHP Billiton plc, 100%)	Cerro Colorado Mine and SX-EW[2] plant, Region I	120[1]

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Copper, Cu content—Continued	Compañía Minera Doña Inés de Collahuasi SCM (Anglo American plc, 44%; Xstrata plc, 44%; companies led by Mitsui & Co. Ltd., 12%)	Collahuasi open pit mine, concentration plant, and SX-EW[2] plant, at Ujina, Region I	590 [1]
Do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	CODELCO Norte Division, including Chuquicamata, Mina Mina Sur, and Radomiro Tomic Mines; and Chuquicamata SX-EW[2] plant (oxide), smelter, and refinery (oxide and sulfide), and Radomiro Tomic SX-EW[2] plant, Region II	900
Do.	do.	El Teniente Division and Mine, and Caletones smelter (anodes) and refinery (fire-refined ingots), Region VI	430
Do.	do.	Ventanas Division, Las Ventanas smelter and refinery (cathodes), Region V	400
Do.	do.	Andina Division, including Rio Blanco and Sur Sur Mines (concentrates), Region V	210
Do.	do.	Salvador Division, including Campamento Antiguo and Damiana Norte open pit mines; Inca underground mine; and Potrerillos SX-EW[2] plant and refinery, Region III	80
Do.	Minera Gaby S.A. [Corporación Nacional del Cobre (CODELCO) (Government, 100%), 100%]	Gabriela Mistral Mine and SX-EW[2] plant, Sierra Gorda, Region II	150 [1]
Do.	Compañía Minera Los Pelambres S.A. (Antofagasta plc, 60%, and a Japanese consortia, 40%)	Los Pelambres open pit mine and concentration plant, Region IV	340
Do.	Minera El Tesoro S.A. (Antofagasta plc, 100%)	El Tesoro open pit mine and SX-EW[2] plant, Region II	100
Do.	Minera Michilla S.A. (Antofagasta plc, 74.2%, and other private Chilean investors, 25.8%)	Michilla Mine and SX-EW[2]/sulfide-leaching plant, Region II	45
Do.	Empresa Nacional de Minería (ENAMI) (Government, 100%)	Hernán Videla Lira smelter (anodes and blister), Paipote, Region III	340
Do.	do.	Concentration plants: Manuel Antonio Matta, Paipote; Osvaldo Martínez, El Salado; and Vallenar, Region III; and José Antonio Moreno, Taltal, Region II	180
Do.	Anglo American Sur S.A. (Anglo American plc, 100%)	Los Bronces Mine (concentrates) and Tortolas SX-EW[2] plant (cathodes), Santiago Metropolitan Region	250
Do.	do.	Chagres smelter (anodes and blister), Region V	175
Do.	do.	El Soldado Mine (concentrates), Region V	50
Do.	Empresa Minera de Mantos Blancos S.A. (Anglo American plc, 99.9%, and other private, 0.1%)	Mantos Blancos open pit mine and SX-EW[2] plant, Region II	100
Do.	do.	Mantoverde open pit mine and SX-EW[2] plant, Region III	65
Do.	Xstrata Copper Chile S.A.	Altonorte smelter (anodes and blister), La Negra, Region II	280 [1]
Do.	Compañía Minera Xstrata Lomas Bayas (Xstrata plc, 100%)	Lomas Bayas Mine and SX-EW[2] plant, Region II	75 [1]
Do.	Sociedad Contractual Minera El Abra [Freeport-McMoRan Copper & Gold Inc., 51%, and Corporación Nacional del Cobre (CODELCO) (Government, 100%), 49%]	El Abra Mine and SX-EW[2] plant, near Calama, Region II	225 [1]
Do.	Cía. Contractual Minera Candelaria (Freeport-McMoRan Copper & Gold Inc., 80%, and SMMA Candelaria Inc., 20%)	Candelaria open pit mine, underground mine, and concentration plant, near Copiapo, Region III	150
Do.	Cía. Contractual Minera Ojos del Salado (Freeport-McMoRan Copper & Gold Inc., 80%, and SMMA Candelaria Inc., 20%)	Ojos del Salado Mine and concentration plant, near Copiapo, Region III	35
Do.	Compañía Minera Zaldivar (Barrick Gold Corp., 100%)	Zaldivar open pit mine and SX-EW[2] plant, Region II	150
Do.	Compañía Minera Quebrada Blanca [Teck Cominco Ltd., 76.5%; Inversiones Mineras S.A., 13.5%; Empresa Nacional de Minería (ENAMI) (Government, 100%), 10%]	Quebrada Blanca open pit mine and SX-EW[2] plant, Region I	100

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Copper, Cu content—Continued		Compañia Minera Carmen de Andacollo [Teck Cominco Ltd., 90%, and Empresa Nacional de Minería (ENAMI) (Government, 100%), 10%]	Carmen de Andacollo Mine and SX-EW[2] plant, Region IV	22
Do.		Alliance Copper Ltd. (Codelco Technologies Ltd., 100%)	Plant to acid-leach fine copper at Chuquicamata, Region II (from residual material produced at CODELCO Norte and El Teniente Divisions)	20
Copper sulfate	metric tons	Compañia Minera Cerro Negro	Portales Mine and a plant at Cabildo, Region V	200
Do.	do.	Minera Capacho Viejo Ltda.	Mine and plant near Tocopilla, Region II	5,000
Do.	do.	Compañia Minera San Gerónimo	Mine and plant near Coquimbo, Region IV	10,000
Diatomite		Celite Chile Ltda. (IMERYS S.A., 100%)	Plant at Port of Arica, and mining operations nearby in Regions I and XV	30
Dolomite		Minera El Jilguero S.A. (Cementos Bío Bío S.A., 100%)	Quarries and plant near Copiapo, Region III	30
Feldspar		Minera Alfa Quintay Ltda.	Quarry and plant, Santiago Metropolitan Region	NA
Do.		J.B. Schiappacase A.	Quarry and plant near Limache, Region V	NA
Do.		Minera Pacífico Ltda.	Quarries and plants in Region VI, and plant in Santiago Metropolitan Region	NA
Ferromolybdenum		Molibdenos y Metales S.A. (MOLYMET) (private, 100%)	Nos plant, San Bernardo, 30 kilometers south of Santiago, Santiago Metropolitan Region	25
Gold:				
Metal ingots	kilograms	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Ventanas refinery, Region V	6,000
Mine output	do.	do.	Andina, CODELCO Norte, El Teniente, and Salvador Divisions (byproduct of copper production)	2,000
Do.	do.	Minera Escondida Ltda., 100%	Escondida copper mine and plants, Region II	4,500
Do.	do.	Cía. Contractual Minera Candelaria, 100%	Candelaria copper mine and plant, Region III	2,500
Do.	do.	Cía. Contractual Minera Ojos del Salado, 100%	Ojos del Salado copper mine and plant, Region III	600
Do.	do.	Compañia Minera Los Pelambres S.A., 100%	Los Pelambres Mine and plant, Region IV	1,200
Do.	do.	Empresa Nacional de Minería (ENAMI) (Government, 100%)	Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; and Vallenar plant, Region III; and José Antonio Moreno plant, Taltal, Region II	400
Do.	do.	Compañia Minera Doña Inés de Collahuasi SCM, 100%	Collahuasi Mine and plants, Region I	NA
Do.	do.	Compañia Minera Mantos de Oro (Kinross Gold Corp., 100%)	La Coipa Mine and plant, Region III, 140 kilometers north of Copiapo	7,400
Do.	do.	Compañia Minera Maricunga (Kinross Gold Corp., 100%)	Maricunga open pit, heap-leach mine, Region III, 100 kilometers east of Copiapo	7,500
Do.	do.	Cía. Minera Meridian S.A. (Yamana Gold Inc., 100%)	El Peñón Mine and concentration plant, Region II	7,000
Do.	do.	Minera Florida S.A. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Santiago Metropolitan Region	2,700
Do.	do.	Compañia Minera Cerro Bayo Ltda. (Mandalay Resources Corp., 100%)	Cerro Bayo Mine and concentration plant, Region XI	1,000
Do.	do.	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique	1,500
Gypsum, natural		Compañia Industrial El Volcán S.A. (Saint-Gobain Gypsum S.A., 100%)	El Volcan quarry near Santiago, Santiago Metropolitan Region	100
Do.		Compañia Minera Romeral S.A. (Etex Group S.A., 59.8%, and Melón S.A., 40.2%)	El Romeral quarry near Santiago, Santiago Metropolitan Region	50
Do.		Minera Lo Valdés Ltda.	Santiago Metropolitan Region	NA
Do.		Compañia Minera Polpaico Ltda.	Yeso Norte Mine, Region II	NA
Do.		Industria Nacional de Cemento S.A. (INACESA), 100%	Mantos verdes quarry near Antofagasta City, Region II	NA
Do.		Antonio Zotti Rosetti y Cía. Sociedad Minera	La Confianza and San Jose Mines near Los Vilos, Region IV; Margarita and San Nicolas Mines, and a plant near Renca, Santiago Metropolitan Region	NA

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Iodine	metric tons	SQM Químicos S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Nueva Victoria Mine and plant and Iris Plant, Region I; El Toco Mine and María Elena plant; and Pampa Blanca and Pedro de Valdivia Mines and plants, Region II	11,000 [1]
Do.	do.	Sociedad Contractual Minera Cosayach (Inverraz S.A., 100%)	Mine and plant near Iquique, Region I	3,000
Do.	do.	Atacama Minerals Chile Sociedad Contractual Minera (Atacama Minerals Corp., 100%)	Mine and plant in Aguas Blancas, Region II	1,100
Do.	do.	ACF Minera S.A.	Lagunas mine and plant near Iquique, Region I	1,400
Iron ore		Compañía Minera del Pacífico S.A. (CMP), 100% (subsidiary of CAP S.A.)	Cristales and El Algarrobo Mines, El Algarrobito and Huasco concentration plants, and Huasco pellet plant, Region III; El Romeral and El Tofo Mines, and El Romeral concentration and pellet-feed plants, Region IV; and El Laco concentration plant, Region II	9,000
Do.		Sociedad Contractual Minera Vallenar Iron Company (Admiralty Resources NL, 100%)	Japonesa and Japonesita Mines, near Vallenar, Region III	2,000
Do.		Cía. Minera Huasco S.A. [Cía. Minera del Pacífico S.A. (CMP), 50%, and MC Inversiones Ltda., 50%]	Los Colorados Mine and concentration plant, Region III	NA
Kaolin		Compañía Minera Polpaico Ltda.	El Guindo Mine and a plant in the Santiago Metropolitan Region	NA
Do.		Minera Lealtad Ltda.	Mine and plant at Til Til, Santiago Metropolitan Region	NA
Do.	metric tons	Mario Alberto Pizarro A.S.A.	Plant at Los Vilos, Region IV	600
Lapis lazuli	do.	Las Flores de los Andes S.A.	Mine near Ovalle, Region IV	400
Lead, mine output	do.	Minera Florida S.A. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Santiago Metropolitan Region	NA
Do.	do.	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique	3,000
Lime, hydraulic		Industria Nacional de Cemento S.A. (INACESA) (Cementos Bío Bío S.A., 100%)	Plants near Antofagasta City, Region II, and near Copiapo City, Region III	880 [1]
Do.		Soprocal Calerías e Industrias S.A.	Plant at Melipilla, Santiago Metropolitan Region	165
Lithium carbonate	metric tons	Sociedad Chilena del Litio Ltda. (subsidiary of Chemetall GmbH, owned by Rockwood Holdings Inc., 100%)	Chemetalle Foote plant at La Negra, near the city of Antofagasta, Region II	26,000
Do.	do.	SQM Salar S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	Plant at Salar del Carmen, near the city of Antofagasta, Region II	43,500 [1]
Lithium chloride	do.	do.	do.	NA
Lithium hydroxide	do.	do.	do.	6,000 [1]
Manganese	do.	Manganesos Atacama S.A. (subsidiary of CAP S.A.)	Plant in Coquimbo city and mines in Region IV[3]	10,000
Marble, dimension stone	do.	Pier Luigi Indri S.A.	Quarry at Cerrillos, Region III	250
Do.	do.	Compañia Minera Feltre Ltda.	Quarry and plant in Region III	1,400
Molybdenum, mine output	do.	Anglo American Sur S.A., 100%	Los Bronces Mine and Tortolas molybdenum flotation plant, Santiago Metropolitan Region	3,000
Do.	do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	CODELCO Norte Division, Region II	20,000
Do.	do.	do.	El Teniente Mine and plant, Region VI	5,500
Do.	do.	do.	Andina Division, Region III	2,500
Do.	do.	do.	El Salvador Division, Region III	1,500
Do.	do.	Compañia Minera Los Pelambres S.A., 100%	Los Pelambres Mine and plant, Region IV	8,500
Do.	do.	Compañia Minera Doña Inés de Collahuasi SCM, 100%	Collahuasi Mine and molybdenum plant, Region I	4,000
Molybdenum oxide, Mo content	do.	Molibdenos y Metales S.A. (MOLYMET) (private, 100%)	Nos plant, San Bernardo, 30 kilometers south of Santiago, Santiago Metropolitan Region	45,000
Do.	do.	do.	Molynor plant, Mejillones, Region II	15,000
Do.	do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	CODELCO Norte Division, Region II	7,500
Natural gas	million cubic meters	Empresa Nacional del Petróleo S.A. (ENAP) (Government, 100%)	About 23 oilfields, including Costa Auera, in the Magallanes basin, Region XII	2,200
Do.	do.	GeoPark Chile Ltd. (operator) (GeoPark Holdings Ltd., 100%)	Oilfields and gasfields and the Kimiri Aike natural gas plant on the Fell block, Magellan or Austral Basin, Region XII	380

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Nitrates:			
Primarily sodium nitrate	SQM Nitratos S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	El Toco Mine and Maria Elena plant; Pampa Blanca and Pedro de Valdivia Mines and plants; and Coya Sur plant, Region II	770 [1]
Primarily potassium nitrate	do.	do.	650 [1]
In fertilizer	Cosayach Nitratos S.A. (Inverraz S.A., 100%)	Mine and plant near Iquique, Region I	200
Do.	SQM Industrial S.A.	Mine and plant near Santiago, Region II	100
Do.	ACF Minera S.A.	Lagunas Mine and plant near Iquique, Region I	NA
Petroleum thousand 42-gallon barrels	Empresa Nacional del Petróleo S.A. (ENAP) (Government, 100%)	About 23 oilfields, including Costa Auera, in the Magallanes basin, Region XII	6,500
Do. do.	GeoPark Chile Ltd. (operator) (GeoPark Holdings Ltd., 100%)	Oil and gas fields in the Fell block, Magellan or Austral Basin, Region XII	800
Petroleum refinery products do.	Empresa Nacional del Petróleo S.A. (ENAP) (Government, 100%)	Aconcagua, Bio Bio, and Gregorio refineries	90,000
Phosphatic materials, natural:			
Guano	Guano Rojo Punta Gruesa Ltda.	Mine and plant near Iquique, Region I	3
Phosphate rock, apatite	César B. Formas Ortiz S.A.	Mine near Chanaral, Region II	20
Do.	Compañía Minera El Sauce Ltda.	Mine near La Serena, Region IV	5
Phosphorite	Compañía Minera de Fosfatos Naturales Ltda. (Bifox Ltda.) (TEHMCORP S.A., 100%)	Mines at and around Bahia Inglesa; Osorno plant near Bahia Inglesa, Region III; and Bahia Inglesa plant at Caldera, Region IV	45
Do.	Sociedad Contractual Minera Bahía Inglesa	Selaqueos Mine near Bahia Inglesa, Region III	NA
Pig iron	Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.) (private, 100%)	Plant in Bahia de San Vicente, Region VIII, 14 kilometers northeast of Concepcion	1,200
Potash (KCl and K_2SO_4), K_2O content	SQM Salar S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	Plant at Salar del Carmen, near the city of Antofagasta, Region II	955
Do.	Sociedad Chilena del Litio Ltda. [Chemetall GmbH (Rockwood Holdings Inc., 100%), 100%]	Chemetalle Foote plant at La Negra, near the city of Antofagasta, Region II	50
Potassium chloride (KCl)	Sociedad Contractual Minera Virginia (Inverraz S.A., 100%)	Mine and plant near Iquique, Region I	NA
Do.	ACF Minera S.A.	Lagunas Mine and plant near Iquique, Region I	NA
Pumicite, including pozzolan	Empresas El Melón S.A.	Quarry at Rinconada Lo Vial near Maipu, and plant at Santiago, Santiago Metropolitan Region	1,200
Do.	Compañía Minera Polpaico Ltda.	Puzolana Norte Mine, Region II; and Puzolana Pudahuel Mine and a plant in the Santiago Metropolitan Region	NA
Do.	Minera Río Teno S.A. (Cementos Bío Bío S.A., 100%)	Quarry and plant near Curico, Region VI	200
Do.	Minera El Way S.A. (Cementos Bío Bío S.A., 100%)	Quarries and plant near Antofagasta, Region II	100
Do.	Harborlite Chile Ltda. (IMERYS S.A., 100%)	Laguna del Maule Mine at Talca, Region VII, and plant at Santiago, Santiago Metropolitan Region	NA
Pyrophyllite metric tons	Sociedad Minera Godoy Schwenger y Cía.	Mine and plant near La Calera, Region V	1,800
Do. do.	José Orrego Bugueño S.A.	Mine and plant near Chincolco, Region V	1,000
Do. do.	Mario Alberto Pizarro A. S.A.	Plant at Los Vilos, Region IV	1,000
Rhenium, metal kilograms	Molibdenos y Metales S.A. (MOLYMET) (private, 100%)	Nos plant, San Bernardo, 30 kilometers south of Santiago, Santiago Metropolitan Region	30,000
Salt, NaCl	Sociedad Minera Punta de Lobos Ltda. (K+S Aktiengesellschaft, 100%)	Open pit mine in the Salar Grande de Tarapaca, Region I, and port facilities at Puerto Patillos	7,000 [1]
Do.	Benjamín Nuñez Ltda.	Mine near Iquique, Region I	NA
Do.	Inversiones Alpina Ltda.	Mine in the Salar Grande Irlanda and plant at Iquique Region I	NA
Do.	Playa Grande Ltda.	Mine in Region I	NA
Do.	José Álvarez Jara Ltda.	do.	NA
Do.	Christian Fletcher Ltda.	do.	NA
Do.	Elías Echeverría Ltda.	do.	NA
Do.	Cía. Minera Cordillera Chile S.C.M.	do.	NA

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Selenium	metric tons	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Ventanas smelter and refinery, noble metals plants, Region V (byproduct of copper production)	95
Silica, quartz		Cedric Fernández y Compañía Ltda.	Mine and plant near Calama, Region II	100
Do.		Antonio Zotti Rosetti y Cía. Sociedad Minera	La Confianza and San Jose Mines near Los Vilos, Region IV; Margarita and San Nicolas Mines, and a plant near Renca, Santiago Metropolitan Region	20
Do.		Minera Alfa Quintay Ltda.	Quarry and plant, Santiago Metropolitan Region	30
Do.		Minera Pacífico Ltda.	do.	NA
Do.		Minera Granos Industriales Ltda.	El Turco Mine and Migrin Plant near Cartagena, Region V	250
Do.		Productora Cuarzo El Peral Ltda.	El Peral Mine and plant near Cartagena, Region V	250
Do.		Sociedad Legal Minera Pedro Luis	Mine and plant near Copiapo, Region III	120
Do.		Minera San Pedro Ltda.	Natacha Mine and El Rulo plant at Til-Til, Santiago Metropolitan Region	30
Do.		SLM Santa Dorila de las Arenitas	Mine and plant at Constitucion, Region VII	250
Do.		Cristalerías Toro S.A.	Mine at Rancagua, Region VI	120
Do.		Vidrios Lirquén S.A.	Mine and glass plant at Lirquen, Region VIII	80
Do.		Minera Arsil S.A.	Mine and plant at Concepcion, Region VIII	50
Silver:				
Metal grains	kilograms	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Ventanas refinery, Region V	220,000
Mine output	do.	do.	Andina, CODELCO Norte, El Teniente, and Salvador Divisions	300,000
Do.	do.	Compañía Minera Mantos de Oro (Kinross Gold Corp., 100%)	La Coipa Mine and plant, Region III, 140 kilometers north of Copiapo	200,000
Do.	do.	Cía. Minera Meridian S.A. (Yamana Gold Inc., 100%)	El Peñón Mine and concentration plant, Region II	320,000
Do.	do.	Minera Florida S.A. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Santiago Metropolitan Region	25,000
Do.	do.	Minera Escondida Ltda., 100%	Escondida copper mine and plants, Region II	180,000
Do.	do.	Empresa Nacional de Minería (ENAMI) (Government, 100%)	Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; Vallenar plant, Region III; and José Antonio Moreno plant, Taltal, Region II	6,000
Do.	do.	Compañía Minera Cerro Bayo Ltda. (Mandalay Resources Corp., 100%)	Cerro Bayo Mine and concentration plant, Region XI	60,000
Do.	do.	Compañía Minera Doña Inés de Collahuasi SCM, 100%	Collahuasi Mine and plants, Region I	60,000
Do.	do.	Compañía Minera Los Pelambres S.A., 100%	Los Pelambres Mine and plant, Region IV	42,000
Do.	do.	Anglo American Sur S.A., 100%	Los Bronces Mine and plants, Santiago Metropolitan Region	35,000
Do.	do.	Cía. Contractual Minera Candelaria, 100%	Candelaria Mine and concentration plant, Region III	30,000
Do.	do.	Cía. Contractual Minera Ojos del Salado, 100%	Ojos del Salado copper mine and plant, Region III	4,500
Do.	do.	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique	11,000
Sodium sulfate	metric tons	SQM Químicos S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Nueva Victoria Mine, Region I, and Maria Elena Mine and Coya Sur plant, Region II	80,000
Do.	do.	Sociedad Legal Minera Santa Inés Uno de Antofagasta	Santa Ines Mine near Antofagasta, Region II	150
Steel, crude		Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.) (private, 100%)	Primary plant in Talcahuano and plant in Rengo, Region VIII	1,450
Do.		Gerdau AZA S.A.	Steel plants in Renca and Colina, Santiago Metropolitan Region	520
Sulfuric acid		Xstrata Copper Chile S.A. (Xstrata plc, 100%)	Altonorte smelter, Region II	900 [1]
Do.		Anglo American Sur S.A. (Anglo American plc, 100%)	Chagres smelter, Region V	500
Do.		Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Ventanas sulfuric acid plant, Region V	370
Do.		do.	Caletones plant, Region VI	1,000
Do.		do.	Chuquicamata plant, Region II	500
Do.		do.	Portrerillos plant, Region III	100
Do.		Empresa Nacional de Minería (ENAMI) (Government, 100%)	Hernán Videla Lira smelter, Paipote, Region III	290

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Talc	metric tons	Sociedad Talco Eduardo Martín Abejón Ltda.	Mines near Constitucion, Region VII, and plant at Santiago, Santiago Metropolitan Region	1,000
Do.	do.	Minera Trucco Ltda.	Mine and plant near Santiago, Santiago Metropolitan Region	NA
Travertine, dimension stone	do.	Mármoles San Marino Chile S.A. (Grupo San Marino S.A., 100%)	Quarry near Calama, Region II, and plant in Til-Til, Santiago Metropolitan Region	7,000
Do.	do.	Andes Travertine & Stones S.A.	Quarry and plant in Region II	NA
Do.	do.	Canteras de Atacama S.A.	Quarry and plant at Calama, Region II	6,000
Zeolites	do.	Sociedad Legal Minera Serrin Tercera	Serrin Tercera Mine and Remulcao Plant at Talca, Region VII	300
Zinc in concentrate	do.	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique	35,000
Do.	do.	Minera Florida S.A. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Santiago Metropolitan Region	6,500

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1] Reported figure.

[2] Solvent-extraction/electrowinning.

[3] No production during 2010.

THE MINERAL INDUSTRY OF COLOMBIA

By Susan Wacaster

In 2010, Colombia was estimated to be the world's ninth ranked nickel-producing country, and the Cerro Matoso operation (99.94% owned by BHP Billiton Ltd. of Australia) was the world's second ranked producer of ferronickel. Colombia was a regionally significant coal producer; at yearend, it had 6.7 billion metric tons (Gt) of proven coal reserves, which accounted for 0.8% of the world total and represented the largest proven reserves of coal in Latin America and the second largest in the Western Hemisphere after the United States. Although Colombia was not a globally significant producer of natural gas or petroleum, the country was a regionally significant producer and had net proven reserves that increased by 14% in 2010 to 1.54 billion barrels (BHP Billiton Ltd., 2011a, p. 28; BP p.l.c., 2011, p. 30; Kuck, 2011).

Minerals in the National Economy

In 2010, Colombia's real gross domestic product (GDP) (at constant 2005 prices) increased by 4.3% compared with about 1.5% in 2009, 3.5% in 2008, 6.9% in 2007, and 6.7% in 2006. The exploitation of mines and quarries (not including petroleum) accounted for about 7.1% of Colombia's GDP in 2010 compared with 6.7% in 2009, 6.1% in 2008, 5.7% in 2007, and 6.0% in 2006, and the sector thus seems to have maintained a relatively constant share of the GDP during the past 5 years. In 2010, the aggregate value of the mineral sector (including energy products) increased by 11.1%, which was attributed to a 16.9% increase in the value of crude petroleum, natural gas, thorium, and uranium production; a 2.2% increase in the value of coal production; a 1.8% increase in the value of metallic mineral production; and a 1.6% increase in the value of nonmetallic mineral production. The aggregate value of metallic minerals increased as a result of an increase in the volume of production of gold, iron, platinum, and silver. Increased international prices for hydrocarbon products contributed to increases in the volume of production of petroleum (by 17.2%), natural gas (8.7%), and coal (2.0%). Increased prices for nonmetallic minerals also led to an increase in the production volume of construction materials and emerald (Departmento Administrativo Nacional de Estadistica, 2011, p. 1–16).

Government Policies and Programs

Colombia's mining law is Law 685 of 2001 (La Ley 685 de 2001). Since 2001, the Colombian Ministry of Mines and Energy (MME), which was created in 1940, had been composed of special administrative units, including the Commission for the Regulation of Energy and Gas and the Mining and Planning Unit (UPME); public organizations, including the Institute for the Planning and Promotion of Energy Solutions (IPSE) and the Nuclear, Environmental, Mining and Geoscientific Information and Research Institute (INGEOMINAS); and associated entities, including Colombian Gas Co. (Ecogas), the Colombian Petroleum Enterprise (ECOPETROL), Electric Interconnection S.A. E.S.P. (ISA), Isagen S.A. E.S.P., National Mining Co. Ltd. (Minercol), and others.

In 2009 and 2010, the MME had been conducting a national census of the mining sector, which was the first such census conducted in the country since the 1980s. The objectives of the census were to help improve planning and organization within the mining sector and get a handle on mining activities, especially small- and medium-scale mines. The census was being conducted in two phases. In the first phase, which was implemented between October 2009 and June 2010, information was collected pertaining to administrative, economic, organizational, social, and technical aspects of mining in Antioquia, Bolivar, Boyaca, Cauca, Cundinamarca, Huila, North of Santander, and Tolima Departments. Phase 2 was started in July 2010 and was to cover the remaining Departments of the country.

The results of the census were to be compiled by yearend 2011 and were expected to be used to determine the number of mining operations and their legality, assess any environmental permits that had been issued, perform a complete labor analysis to include the number of people working at various sites (and those working directly in mining or other associated economic activities) and the number of child laborers, quantify production volumes by mineral, determine the method of exploitation and the number of operations that were paying royalties, and more (Ministerio de Minas y Energia, 2011a).

Production

In 2010, copper production decreased by 37.5% to 3,555 metric tons (t) from a revised 5,688 t in 2009. This was an indication that the only reported producing copper mine in the country was winding down operations, as had been reported for several years, or perhaps was processing lower grade ores. There did not appear to be any copper mine projects in the feasibility stage and none appeared to be coming online in the near term. Gold production increased by 12% compared with that of 2009 and was carried out by at least three companies at their respective properties, including Gran Colombia Gold Corp. of Canada's El Silencio, Providencia, and Sandra K Mines; Mineros S.A.'s Antioquia Mine; and Minera el Roble S.A.'s El Roble Mine.

Production of nickel from ferronickel decreased by about 5% in 2010 to 49,443 t, all of which was from BHP Billiton's Cerro Matoso laterite nickel operation in Montelibano. Reported emerald production increased by 78% in 2010 compared with that of 2000; however, information regarding the actual tonnage of emerald produced in Colombia (which had typically been reported as the volume of emerald recorded as exports rather than the volume of emerald produced in the country) continued to be unavailable (table 1).

Structure of the Mineral Industry

Table 2 is a list of major mineral facilities.

Mineral Trade

In 2010, the value of nonfuel mineral sector exports from Colombia increased to about $9.4 million compared with $8.2 million in 2009, $7.4 million in 2008, $9.0 million in 2007, and $7.4 million in 2006. Mineral exports accounted for about 24% of the value of all exports in 2010 compared with 25% in 2009, 20% in 2008, 30% in 2007, and 30% in 2006. Thus, although the value of mineral exports in 2010 exceeded that of each of the past 5 years, the value of mineral exports as a percentage of total exports remained below the level recorded before the global economic downturn of 2008. In 2010, the value of gold exports increased by 36% to $2.1 billion, the value of ferronickel exports increased by 28% to $967 million, and the value of coal and coke exports was about $6 million compared with $5.4 million in 2009 (Ministerio de Minas y Energia, 2011b).

Commodity Review

Metals

Gold.—In 2010, Mineros' Antioquia Mine produced about 28,000 kilograms (kg) of gold from its operation at Mina La Ye. Annual production reportedly decreased by about 350 kg as a result of sabotage of the company's electrical unit on three separate occasions. In 2011, Mina La Ye, which was the company's only producing mine, had total estimated reserves and resources of about 5,700 kg of contained gold and the company's Aluvion and greenfield exploration projects were estimated to have an estimated 38,000 kg of contained gold in reserves and resources (Minero S.A., 2010, p. 16; 2011).

Starting in 2008, the Colombian Government began to seek bids for the bankrupt Frontino Gold Mines Ltd.'s Frontino property. In early 2010, Medoro Resources Ltd. of Canada was in negotiations with Frontino to acquire the property. Medoro intended to sell a 50% interest in Frontino's assets to Gran Colombia Gold, and the agreement was scheduled to be made final in mid-2010. A coalition of local workers, owners, and creditors of Frontino Gold Mines, the Segovia City council, and other people of the region disputed the agreement and claimed that they were the rightful owners of the mine. Medoro received Government support for the acquisition from the MME and by June reported that it was proceeding with the acquisition.

Medoro's funding for the acquisition, however, became problematic, and the joint-venture partners renegotiated their agreement so that the $200 million purchase price would be fully funded by Gran Colombia Gold. Medoro reportedly had an option to gain a 50% share by paying one-half of the purchase price and due diligence costs within 1 year, during which time the company would retain a 5% carried interest in the project. By early September 2010, Gran Columbia Gold completed the acquisition of the mining assets of Frontino Gold Mines and had resumed operations at the three underground mines (El Silencio, Providencia, and Sandra K Mines). The company produced about 450 kg of gold in 2010 in its first year of renewed operations.

Gran Colombia Gold also had several small- to medium-scale contractors in the area that were producing a combined 700 kilograms per year (kg/yr) of gold and numerous exploration projects ongoing in Colombia. The company expected to increase gold production to about 3,000 kg/yr by the end of 2011 and reported that it was in the process of hiring about 1,600 former Frontino employees. It remained unclear what, if any, conciliatory actions were made on behalf of the local unionized workers who objected to the acquisition (Gran Colombia Gold Corp., 2010; Medoro Resources Ltd., 2010a–d; Reuters.com, 2010).

Nickel.—In 2010, the nickel content of Colombia's ferronickel production decreased by about 5% to about 49,400 t compared with output in 2009. The decreased production was attributed to the planned replacement of the 27-year-old Line 1 furnace at Cerro Matoso, which was being done to improve the operational reliability and to accommodate changes in the mineralogy of the ore feed. Cerro Matoso's ore reserves were updated as the result of revised geologic modeling, mine design, and mining cost estimates. The new reserve estimates as of June 30, 2011, included total proven and probable laterite ore reserves of 48 Mt grading 1.3% nickel and about 65 Mt of other ores and stockpiles grading between 0.2% and 1.3% nickel. In 2011, the company began conceptual studies into options for expanding production at Cerro Matoso and began work on a feasibility study for adding a heap-leach project to the operation (BHP Billiton Ltd., 2011a, p. 27–30, 69; 2011b, p. 4; 2011c, p.14).

Outlook

Economic growth in Colombia was expected to remain strong in 2011 with a projected real GDP growth rate of 4.9% compared with 4.3% in 2010. The country's projected growth is in line with numerous South American mineral commodity exporting countries that are expected to be less directly affected by the negative economic situation in the United States, the debt crises in Europe, or any potential economic downturn in Asia than most of Central America, Mexico, and the Caribbean (which suffered from high national debt levels). Nevertheless, Colombia's projected GDP growth rate placed it only 9th among 12 South American nations in 2011 (and 5th in 2012, as strong growth in other South American countries was predicted to be moderate), so a downward shock to commodity prices could still cause a slowdown to the overall economy in Colombia that might not affect other South American countries. By yearend 2010, at least one-half dozen precious- and (or) base-metal projects had projected startup dates of between 2010 and 2015, but without any major projects coming online, Colombia's mineral sector will likely maintain the relatively constant share of the GDP that it has had in recent years (International Monetary Fund, 2011).

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TABLE 1
COLOMBIA: PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010[p]
METALS						
Copper, mine output, Cu content		2,902	4,196	5,248	5,688 [r]	3,555 [3,4]
Gold	kilograms	15,683	15,482	34,321	47,838 [r]	53,606 [3,4]
Iron and steel:						
Iron ore and concentrate	thousand metric tons	644	624	473	281 [r]	77 [3,4]
Pig iron	do.	360	341	300	342 [r]	327 [4]
Steel, crude	do.	1,221	1,260	1,125	1,053 [r]	1,213 [4]
Semimanufactures, hot-rolled	do.	1,598	1,598	1,435	1,454	1,614 [4]
Nickel:						
Mine output, Ni content		94,100	75,864	64,200	72,000 [e]	70,200 [e]
Ferronickel, Ni content		51,137	49,314	41,636	51,802 [r]	49,443 [3,4]
Platinum	kilograms	1,438	1,526	1,370	929 [r]	997 [3,4]
Silver	do.	8,399	9,765	9,162	10,827 [r]	15,300 [3,4]
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	10,038	11,068	10,456	9,100	10,000 [e]
Gemstones, emerald[5]	thousand carats	5,734	3,389	2,122	2,945 [r]	5,230 [3,4]
Salt:						
Rock		248,245	204,090	245,170	255,332 [r]	288,676 [3,4]
Marine		389,630	309,557	386,461	356,481 [r]	356,797 [3,4]
Total		637,875	513,647	631,631	611,813	654,473
Stone and sand, limestone for cement		11,993	13,229	12,699	11,300	13,000 [e]
Sulfur:						
Native (from ore)		47,438	48,999	56,892	54,367 [r]	59,556 [3,4]
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand metric tons	66,192	69,902	73,502	72,807 [r]	74,350 [3,4]
Gas, natural, gross	million cubic meters	3,958	7,679	9,033	10,400	11,300 [4]
Petroleum:						
Crude	thousand 42-gallon barrels	193,085	193,815	214,620	244,800	286,890 [4]
Refinery products:						
Gasoline:						
Aviation	do.	388	136	106	100	100 [e]
Motor (extra)	do.	1,739	1,560	2,101 [r]	2,123 [r]	2,200 [e]
Motor (regular)	do.	28,240 [r]	25,272 [r]	34,067 [r]	34,431 [r]	35,000 [e]
Jet fuel	do.	6,421	5,834 [r]	7,726 [r]	8,368 [r]	8,400 [e]
Kerosene	do.	112	121 [r]	148 [r]	160 [r]	170 [e]
Medium distillate fuel oil	do.	36,909 [r]	38,741 [r]	36,692 [r]	35,214 [r]	36,000 [e]
Natural gas liquids (propane)	do.	7,649 [r]	6,552 [r]	7,275	7,368 [r]	7,400 [e]
Residual fuel oil (black oil)	do.	23,379	24,437	23,022 [r]	21,694 [r]	22,000 [e]
Asphalt	do.	1,175 [r]	1,167 [r]	1,188 [r]	1,365 [r]	1,300 [e]
Total	do.	106,012 [r]	103,820 [r]	112,325 [r]	110,823 [r]	112,570 [e]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. do. Ditto. [p] Preliminary. [r] Revised.

[1] Table includes data available through October 10, 2011.

[2] In addition to the commodities listed, Colombia also produced clays, coke, feldspar, gypsum, magnesite, phosphate rock, sand and gravel, secondary iron, and sulfur (byproduct from petroleum processing), but available information is inadequate to make reliable estimates of output.

[3] Data from Sistema de Informacion Minero Colombiano.

[4] Reported figure.

[5] Based on production reports as determined by payments of royalties and other economic considerations prior to export.

TABLE 2
COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Cía. Colombiana de Clinker S.A. (Cementos Argos Colombia S.A., 100%)	Plant at Cartagena, Bolivar Department	1,250
Do.		Cementos del Caribe S.A. (Cementos Argos Colombia S.A., 74%)	Barranquilla, Atlantico Department	1,500
Do.		Cementos del Valle S.A. (Cementos Argos Colombia S.A., 70%)	Yumbo, Valle del Cauca Department	1,500
Do.		Cales y Cementos de Toluviejo S.A. (Cementos Argos Colombia S.A., 95%)	Toluviejo, Sucre Department	980
Do.		Cementos del Nare S.A. (Cementos Argos Colombia S.A., 100%)	Puerto Nare, Antioquia Department	210
Do.		Cementos El Cairo S.A. (Cementos Argos Colombia S.A., 100%)	Montebello, Antioquia Department	450
Do.		Cementos Paz del Río S.A. (Cementos Argos Colombia S.A., 62%)	Belencito, Boyaca Department	880
Do.		Cementos Ríoclaro S.A. (Cementos Argos Colombia S.A., 99%)	Sonson, Antioquia Department	1,400
Do.		Cementos Boyacá S.A. (Holcim Group, 100%)	Nobsa, Boyaca Department	1,500
Do.		CEMEX Colombia S.A. (CEMEX S.A.B. de C.V., 99.7%)	Bucaramanga, Santander Department; Buenos Aires, Tolima Department; Pamplona, Norte de Santander Department; La Calera, Cundinamarca	3,980
Coal		Carbones del Cerrejón LLC (Anglo American Plc, 33.3%; BHP Billiton plc, 33.3%; Xstrata plc., 33.3%)	Cerrejon Centro Mines, Cerrejon Sur Mines, Cerrejon Zona Norte, and Oreganal Mines, La Guajira Department	30,000
Do.		Drummond Ltd. (Drummond Co. Inc., 100%)	La Loma Mine, Cesar Department	23,000
Do.		C.I. Prodeco S.A. (Glencore International AG, 100%)	Calenturitas Mine, Cesar Department	11,000
Do.		Carbones de La Jagua S.A. (Glencore International AG, 100%)	La Jagua Mine, La Jagua de Ibirico, Cesar Department	2,500
Do.		Coalcorp [Coalcorp Mining Inc., La Francia, 100% (Caypa, 60%, and Xira Investment Co., 40%)]	La Francia Mine, Cesar Department, and Caypa Mine, La Guarjira Department	2,000
Do.		Acerías Paz del Rio S.A. (Votorantim Group, 52%)	Paz del Rio Mine, Boyaca Department	350
Copper		Minera El Roble S.A.	El Roble Mine, El Carmen, Choco Department	3
Gold	kilograms	Gran Colombia Gold Corp. (private, 100%)	Gran Colombia, Antioquia Department	2000
Do.	do.	Mineros S.A. (private, 100%)	Mina La Ye, Rio Nechi, Antioquia Department	4,000
Do.	do.	Small miners (cooperatives and individual prospectors)	do.	NA
Do.	do.	Minera El Roble S.A.	El Roble Mine, El Carmen, Choco Department	NA
Iron and steel, steel		do.	do.	400
Do.		Diaco S.A. (Gerdau S.A., 98%)	Tuta and Duitama, Boyaca; Cali, Valle del Cauca; Tocancipa, Cundinamarca; Muna, near Bogota	NA
Do.		Siderúrgica del Pacífico S.A. (private, 100%)	Plant at Yumbo, Valle de Cauca Department	60
Iron ore		Acerías Paz del Rio S.A. (Votorantim Metals, 72.67%)	El Uvo, Pirgua, and Ubals Mines, Boyaca Department, and plants, Boyaca Department	450
Natural gas	million cubic meters	Ecopetrol S.A. (Government, 100%)	North coast, La Guajira Department (national gasfields)	4,500
Nickel		Cerro Matoso S.A. (BHP Billiton Ltd., 99.4%, and Mineworkers, .06%	Cerro Matoso Mine and ferronickel plant, Montelibano, Cordoba Department	55

See footnotes at end of table.

TABLE 2—Continued
COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum	thousand 42-gallon barrels	Ecopetrol S.A.	16 fields in various Departments	70,000
Petroleum products	do.	do.	Barrancabermeja refinery, Norte de Santander Department	81,400
Do.	do.	do.	Tibu, Norte de Santander Department	1,825
Do.	do.	do.	Orito, Putumayo Department	875
Sulfur		Industrias Purace S.A. (private, 100%)	El Vinagre Mine, Cauca Department	NA
Do.		Ecopetrol S.A.	Barrancabermeja, Santander Department	NA

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

THE MINERAL INDUSTRY OF CUBA

By Omayra Bermúdez-Lugo

Nickel was the most important mineral commodity to the Cuban economy, followed by cobalt, which was produced as a byproduct of the mining of nickel. Other minerals produced in the country included asphalt, bentonite, cement, chromite, clay, crushed stone, feldspar, gypsum, iron ore, lime, limestone, marble, salt, sand, steel, sulfuric acid, volcanic ash, and zeolites. Cuba also produced ammonia, natural gas, petroleum, petroleum products, and sulfur as a byproduct of the refining of petroleum.

Production

Production of most industrial minerals, with the exception of gypsum, hydraulic cement, and lime, decreased during the year. Production of gypsum increased by 42% to 111,000 metric tons (t) and that of lime increased by 8% to 49,700 t; the increase in the production of hydraulic cement was not significant. Production of kaolinite decreased by 95% to 100 t; bentonite, by 66% to 228 t; feldspar, by 40% to 2,800 t; silica sand, by 32% to 11,100 cubic meters; marble, by 17% to 4,300 t; and limestone, by 10% to 2.6 million metric tons (Mt). In the mineral fuels sector, the most significant increase in production was that of petroleum coke, which increased by 120% to 41,000 barrels, followed by liquefied petroleum gas (28.6%), lubricants (25.9%), gasoline (15.4%), and crude petroleum (10.7%). Data on mineral production are in table 1.

Cuba's Oficina Nacional de Estadísticas [National Statistics Office] stopped reporting cobalt and nickel production in 2007; consequently, production of cobalt and nickel for 2009 and 2010 are estimated.

Structure of the Mineral Industry

The Ministerio de la Industria Básica was the Government entity responsible for the mineral and petroleum sectors. Unión Geológico Minera S.A. was the company in charge of prospecting, exploration, and mining of all metallic and nonmetallic minerals with the exception of cobalt and nickel. The production of chromite, cobalt, and nickel was overseen by Grupo Empresarial Cubaníquel S.A. Petroleum prospecting, exploration, marketing, and refining were overseen by Cubapetróleo S.A. Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Cobalt and Nickel.—Cuba (51%) in joint venture with the Government of Venezuela (49%) was in the process of refurbishing the 68,000 metric-ton-per-year (t/yr) Las Camariocas ferronickel plant at a cost of $700 million. Las Camariocas plant was located in the city of Moa in Holguin Province. Construction of the plant had been undertaken by Czechoslovakia in 1983 through the then Council for Mutual Economic Assistance, but the project was never completed. Cuba and Venezuela planned to ship the ferronickel produced at Las Camariocas to a 500,000-t/yr stainless steel plant in Venezuela, which was also jointly owned by the two Governments. The plant was expected to be operational by 2013 (China Daily, 2010; CubaStandard.com, 2010; El Universal, 2010).

Sherritt International Corp.'s Moa operation produced a total of 33,972 t of nickel and 3,706 t of cobalt in 2010. Sherritt operated the Moa facility in joint venture with the Government (each owned a 50% interest). Production from Moa was processed in a refinery located in Fort Saskatchewan, Alberta, Canada. The company planned to review options for the completion of an expansion at Moa and the construction of a sulfuric acid plant (Sherritt International Corp., 2011, p. 8–9).

Mineral Fuels

Petroleum.—Sherritt held an indirect working interest that varied from 40% to 100% in various petroleum production-sharing contracts in Cuba. The company produced petroleum from near-shore reservoirs off the northern coast of Cuba, which were explored and developed from land-based drilling locations. The average gross working-interest production of oil and gas in Cuba was approximately 21,204 barrels per day in 2010.

More extensive coverage of the mineral industry of Cuba can be found in the 2008 U.S. Geological Survey Minerals Yearbook, volume III, Area reports—International—Latin America and Canada, which is available on the World Wide Web at http://minerals.usgs.gov/minerals/pubs/country.

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TABLE 1

CUBA: PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2006	2007	2008	2009	2010
Asphalt		49,900	55,900	61,600	80,200	86,900
Bentonite		355	401	382	670	228
Cement, hydraulic		1,704,700	1,805,300	1,705,200 [r]	1,625,700	1,631,400
Chromite		27,900	--	--	--	--
Cobalt, mine output, Co content:[4]						
Oxide, oxide sinter, sulfide, ammoniacal liquor precipitate		6,081	5,029	3,597	4,000 [r,e]	4,100 [e]
Sulfide and ammoniacal liquor precipitate		5,602	4,540	3,175	3,500 [r,e]	3,600 [e]
Feldspar		5,500	5,600	4,300	4,700	2,800
Gypsum[e]	thousand metric tons	73	80	110	78	111
Iron ore:						
Gross weight		7,800	3,300	--	--	--
Fe content[e]		3,500	1,500	--	--	--
Kaolinite		1,700	2,000	2,000 [e]	2,000 [e]	100
Lime		36,300	42,800	49,900	46,000	49,700
Limestone	thousand metric tons	1,700	1,400	1,500	2,900	2,600
Marble	cubic meters	5,500	4,200	3,800	5,200	4,300
Natural gas, marketed	thousand cubic meters	1,090,600	1,217,900	1,161,000	1,155,300	1,072,500
Nickel, Ni content:[4]						
Mine output, oxide, oxide sinter, sulfide, ammoniacal liquor precipitate		73,371	73,934	67,265	70,000 [e]	71,000 [e]
Metallurgical products:						
Granular oxide, oxide sinter, powder		39,121	39,911	34,478	35,000 [e]	35,500 [e]
Sulfide		30,967	31,116	32,465	32,500 [e]	33,000 [e]
Ammoniacal liquor		3,283	2,907	322	300 [e]	300 [e]
Total		73,371	73,934	67,265	67,800 [e]	68,800 [e]
Nitrogen, N content of ammonia		42,300	47,400	41,700	27,200	36,000
Petroleum:						
Crude[5]	thousand 42-gallon barrels	18,702	18,734	19,367	17,614	19,507
Refinery products:[6]						
Petroleum coke	do.	78	76	34	19	41
Gasoline, motor	do.	2,707	3,345	6,109	4,197	4,844
Kerosene	do.	973	536	325	182	2
Liquefied petroleum gas	do.	719	681	651	536	689
Lubricants	do.	316	350	360	263	330
Naphtha	do.	690	496	490	1,376	736
Total	do.	5,483	5,484	7,969	6,572	6,642
Salt	thousand metric tons	266	141	157	266	272
Sand, calcareous	thousand cubic meters	1,977	2,730	1,827	1,693	1,686
Silica sand	cubic meters	9,000	21,400	29,100	16,400 [r]	11,100
Stone, crushed	thousand cubic meters	3,044	3,815	3,568	3,416	3,234
Steel		257,200	262,400	273,800	265,800	277,600
Sulfuric acid	thousand metric tons	406	428	412	423	423
Volcanic ash		3,500	38,000	34,600	62,100 [r]	72,300
Zeolites		14,000	16,200	20,400	25,800	30,900

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through December 31, 2011.

[2] Statistical data reported by the Cuban Government in Anuario Estadístico de Cuba, unless otherwise specified.

[3] In addition to commodities listed, crude construction materials (sand and gravel, and so forth) may also be produced, but data on such production are not available, and information is inadequate to make reliable estimates of output.

[4] The Government of Cuba reports figures of nickel-cobalt content of granular and powder oxide, oxide sinter, and sulfide production. The cobalt content of reported nickel-cobalt production was determined to be 1.16% of granular and powder oxide, 1.21% of oxide sinter, 7.56% of sulfide, and 33% of ammoniacal liquor. The remainder of reported figures represent the nickel content.

[5] Production has been converted from metric tons to barrels by using the U.S. Energy Information Administration's factor of 6.449 barrels per metric ton (bbl/t) of crude petroleum.

[6] Production has been converted from metric tons to barrels by using the U.S. Energy Information Administration's factor of 5.51 bbl/t for petroleum coke; 8.53 bbl/t for gasoline; 7.73 bbl/t for kerosene; 11.63 bbl/t for liquefied petroleum gas; 7.00 bbl/t for lubricants; and 8.22 bbl/t for naphtha.

TABLE 2
CUBA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Cementos Cienfuegos S.A. (Government, 50%, and Las Pailas de Cemento S.A., 50%)	Cienfuegos	1,500
Do.		Fábrica de Cemento 26 de julio	Nuevitas	600
Do.		Fábrica de Cemento Mártires de Artemisa	Artemisa	600
Do.		Cementos Curazao N.V.	Barrio Mujica, Mariel Province	1,110
Do.		Fábrica de Cemento Siguaney	Sancti Spiritus	300
Chromite		Grupo Empresarial Cubaníquel S.A. (Government, 100%)	Moa, Holguin Province	30
Cobalt		Metals Enterprise S.A. (Government, 50%, and Sherritt International Corp., 50%)	do.	3
Gold	kilograms	Oro-Barita Mine (Government 100%)	El Cobre, Santiago[1]	NA
Nickel		Empresa Niquelifera Ernesto Che Guevara	Ernesto Che Guevara Mine Punta Gorda, Holguin Province	33
Do.		Moa Nickel S.A. (Government, 50%, and Sherritt International Corp., 50%)	Pedro Soto Alba Mine, Holguin Province	37
Do.		Empresa Niquelifera Comandante René Ramos Latour (Government, 100%)	Rene Ramos Latour Mine, Nicaro Holguin Province	12.4
Petroleum:				
Crude:	thousand 42-gallon barrels	Empresa de Perforación y Extracción de Petróleo del Centro (Government, 100%)	Northern coast between Havana and Cardenas	12
Do.		Sherrit International Corp. (indirect working interests vary from 40% to 100% in 10 production-sharing contracts with the Government)	Near shore oilfields located at Yumuri, Varadero, Canasi, and Puerto Escondido	7,000
Refinery products	thousand 42-gallon barrels	PDV-Cupet S.A. (Government, 51%, and Petróleos de Venezuela S.A., 49%)	Cienfuegos refinery, Cienfuegos, 250 kilometers from Havana	23,725
Do.	do.	Hermanos Díaz	Santiago de Cuba	8,000
Do.	do.	Ñico López Refinery (Government, 100%)	Havana	NA
Sand		Algaba quarry	Sancti Spiritus	50
Do.		Malabe quarry	NA	32
Do.		Cajobabo	Imias	NA
Steel		Grupo Metalúrgico Acinox (Government, 100%), including: Antillana de Acero	Cotorro, Havana Province	600
Do.		Empresa de Aceros Inoxidables	Las Tunas, Las Tunas Province	370
Do.		4 other steel plants	NA	NA
Zeolite		Empresa Geominera Oriente	Holguin Province	58

Do., do. Ditto. NA Not available.

[1] Under development.

THE MINERAL INDUSTRIES OF THE DOMINICAN REPUBLIC AND HAITI

By Susan Wacaster

DOMINICAN REPUBLIC

In 2010, the Dominican Republic's nickel production ranking, usually about 11th globally, was insignificant compared with previous years because of a shutdown between August 2008 and October 2010 at Xstrata Nickel of the United Kingdom's Falconbridge Dominicana C. por A. (Falcondo) operation in Bonao. The company had halted operations at the facility, which started up in 1971, because of a combination of high energy costs and diminished market conditions. In 2010, Xstrata signed an agreement with a local power company, AES Dominicana, to supply electricity in order to restart operations quickly as Xstrata continued work on a long-term plan of converting from petroleum to natural gas to fuel the operation. Naphtha, which was produced at the facility's refinery, would still be used to fuel metallurgical reduction processes (Kuck, 2011; Xstrata plc, 2011).

The contribution of the mining and quarrying sector to the country's gross domestic product (GDP) had been decreasing every year since at least 1991 when it was 1.4% of the GDP; the sector contributed 0.2% of the GDP in 2010, which was the same as in 2009. Coincident with the two decades of decreasing annual contributions from the mining and quarrying sector were fluctuations in the price of nickel, decreasing nickel grades, and occasional closures at Falcondo, which was the country's primary source for revenue from mining, as well as a cessation of gold and silver exports from the Dominican Republic beginning in 1991 (Banco Central de la República Dominicana, 2011b).

In the short term, the mining sector's value and contribution to the GDP is expected to increase dramatically compared with previous years as the Pueblo Viejo Dominicana Corp.'s Pueblo Viejo project (Barrick Gold Corp., 60%, and Goldcorp Inc., 40%, both of Canada) comes online in late 2011 or early 2012, and Perilya Ltd. of Australia's Cerro de Maimon Mine, which started up in 2009, reaches maximum production levels. Additionally, there were at least a dozen deposits of various ore body types, including hydrothermally altered and porphyry, which were at various stages of development for production of copper, gold, silver, and zinc projects (Redwood, 2010).

Production

Data on mineral production are in table 1. Xstrata restarted operations at Falcondo in October 2010 and reportedly expected production to ramp up to 50% of capacity, or 14,000 metric tons per year (t/yr), by March 2011 (Xstrata plc, 2011).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Mineral Trade

The Dominican Republic did not export any ferronickel in 2010. The country imported about 9.9 million barrels (Mbbl) of crude oil valued at $777.6 million compared with 9.3 Mbbl valued at $592 million in 2009. Combustible fuels valued at about $2.7 billion included 9.1 Mbbl of liquefied petroleum gas valued at $485 million, 9 Mbbl of natural gas ($146.2 million), 8 Mbbl of diesel ($562 million), 7.9 Mbbl of fuel oil ($562.2 million), 5.9 Mbbl of gasoline ($515.2 million), and 14,053 barrels (bbl) of aviation fuel ($1.9 million). Other raw material imports included $606.2 million worth of iron and steel compared with $360.4 million in 2009, and $102 million worth of coal compared with $84.8 million in 2009 (Banco Central de la República Dominicana, 2011a).

Commodity Review

Metals

Copper.—In 2010, Cerro Maimon was wholly acquired by Perilya (Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%) through its purchase of GlobeStar Mining Corp., which was completed in January 2011. Cerro Maimon is an open pit operation located in Bonao that produced about 9,000 metric tons (t) of copper, 500 kilograms (kg) of gold, and 20,300 kg of silver in 2010 compared with 11,500 t of copper, 173 kg of gold, and 450 kg of silver in 2009. The deposit is composed of sulfide and oxide ores in a stratabound volcanogenic massive sulfide ore body (GlobeStar Mining Corp., 2010, p. 3–4; Perilya Ltd., 2011).

Gold.—The Pueblo Viejo gold project is located in Cotui. The deposit is hosted by the Los Ranchos formation, which is a sequence of conglomerates and black laminated carbonaceous and pyrite sediments that host gold and silver in a volcano sedimentary complex. In February 2010, Barrick announced updated proven and probable reserves of 251.9 million metric tons (Mt) of ore grading 2.9 grams per metric ton (g/t) gold, 17.5 g/t silver, and 0.09% copper with measured and indicated resources estimated to be 107.1 Mt grading 2.07 g/t gold, 11.5 g/t silver, and 0.07% copper. Startup was projected to take place at Pueblo Viejo in the fourth quarter of 2011. The estimated preproduction capital cost was $2.7 billion and another $300 million had been budgeted to expand production from an initial 18,000 metric tons per day (t/d) to 24,000 t/d. About 1,500 kg of gold was expected to be produced in 2011. In March 2011, Barrick secured environmental permits for temporary power sources with which to commission the plant. The environmental impact assessment for a 240-kilovolt power line was approved, which allowed construction of associated infrastructure to begin. Construction was 55% completed, and a total of 2.9 Mt of ore had been stockpiled.

By May 2011, however, the tailings facility was damaged by water from heavy rainfall and the damage was expected to negatively affect the startup schedule, which had been extended to the March 2012 quarter (Redwood, 2010; Barrick Gold Corp., 2011, p. 4, 91; Goldcorp Inc., 2011a, b).

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HAITI

In 2010, Haiti's year-on-year GDP decreased by 5.4%. A similar annual rate of decrease had not taken place since 1993; that decrease was the result of a trade embargo that was leveled on Haiti following a period of political turmoil that began in 1991. The decrease in the GDP in 2010 was directly attributable to the effects of the extremely destructive magnitude 7.0 earthquake of January 12, 2010, combined with some still lingering, yet comparatively minor, effects of the 2008 hurricane season during which one tropical storm, a category 1 hurricane, and two category 4 hurricanes swept through the country (Institut Haitien de Statistique et d'Informatique, 2011).

The private companies involved in exploration for metals in the north of Haiti were relatively unaffected by the earthquake's devastation primarily because the valuable metal deposits under exploration are located in the north of Haiti where the damage was very light and the perceived shaking was only moderate compared with that in and around the epicenter near Port au Prince. Because production by the extractive industries had generated only between about 0.3% and 0.5% of the total value generated by the other industries of Haiti's primary sector (agriculture, forestry, livestock, and fisheries) since at least 1996, the climactic events of 2008 and 2010 effectively caused little overall change to mineral industry statistics and activities. Developments were taking place, though, as such companies as Newmont Mining Corp. of the United States and Eurasian Minerals Inc. and Majescor Resources Inc. of Canada continued to explore and establish agreements related to developing their properties in Haiti; however, no projects were to be brought into production in the near term (U.S. Geological Survey, 2011).

There were few developments in the mineral industry of Haiti in 2010 and no production data were available. For a review of activities relevant to the mining industry in Haiti since the early 1990s through 2009, see the 2009 U.S. Geological Survey Minerals Yearbook, volume III, Area reports—International—Latin America and Canada, which is available on the World Wide Web at http://minerals.usgs.gov/mineral/pubs/country.

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TABLE 1
DOMINICAN REPUBLIC AND HAITI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2006	2007	2008	2009	2010
DOMINICAN REPUBLIC						
Cement, hydraulic		3,776,798	4,100,000	4,000,000	3,000,000	3,200,000
Clay		NA [r]	NA [r]	NA [r]	NA [r]	NA
Copper, mine output, Cu content		--	--	--	11,500	9,000
Gold, mine output, Au content	kilograms	--	--	--	173	500
Gypsum		355,641	350,000	350,000	175,000	195,000
Iron and steel:						
Ferroalloys, ferronickel[e]		76,659 [2]	84,005 [2]	84,000	84,000	84,000
Steel, crude[e]		60,000	60,000	60,000	60,000	60,000
Lime	thousand metric tons	NA [r]	NA [r]	NA [r]	NA [r]	NA
Limestone[e]	do.	1,200	1,200	1,200	1,200	1,200
Marble	cubic meters	6,000	6,000	6,000	6,000	6,000
Nickel, Ni content:						
Mine output, laterite ore		4,096,216	4,062,530	31,300	500	--
Metal, Ni contained in ferronickel, smelter		29,675	29,130	18,782	--	--
Petroleum, refinery products:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	500	500	500	500	500
Gasoline, motor	do.	3,749 [r, 2]	3,447 [r, 2]	3,277 [r, 2]	3,000 [r]	3000
Kerosene	do.	100	100	100	100	100
Jet fuel	do.	1,900	1,900	1,900	1,900	1,900
Distillate fuel oil	do.	2,900	2,900	2,900	2,900	2,900
Residual fuel oil	do.	4,600	4,600	4,600	4,600	4,600
Total	do.	12,000	12,000	12,000	13,000	13,000
Salt, marine[e]		50,000	50,000	50,000	50,000	50,000
Sand and gravel[e]	thousand cubic meters	13,300	13,300	13,300	13,300	13,300
Silver, mine output, Ag content	kilograms	--	--	--	450	20,300
HAITI[e]						
Cement		290,000	290,000	290,000	290,000	290,000
Sand and gravel:						
Gravel	cubic meters	450,000	450,000	450,000	450,000	450,000
Sand	do.	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Stone, marble	do.	131	131	131	131	131

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. NA Not available. -- Zero.

[1] Table includes data available through July 17, 2011.

[2] Reported figure.

TABLE 2
DOMINICAN REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper		GlobeStar Mining Corp.	Bonao	15,000
Gold	kilograms	do.	do.	600
Nickel		Falconbridge Dominicana C. por A. (Xstrata plc, 85.3%; Government, 10%; Franco-Nevada Corp., 4.1%; private interests, 0.8%)	do.	29,000
Petroleum, refinery	42-gallon barrels per day	Refinería Dominicana de Petróleo S.A. (Government, 50%, and Shell International Petroleum Company Ltd., 50%)	Haina Port	34,000
Silver	kilograms	GlobeStar Mining Corp.	Bonao	15,000

do. ditto.

THE MINERAL INDUSTRY OF ECUADOR

By Susan Wacaster

In 2010, Ecuador was not a significant producer of mineral commodities despite having significant deposits of base and precious metals. Petroleum and refinery products output generally decreased compared with that of 2009 owing to major changes in the production contracts between the Government and petroleum producing companies; nevertheless, the country maintained its position as the fifth ranked petroleum producer in Central America and South America (BP p.l.c., 2011, p. 8).

Minerals in the National Economy

In 2010, the value contributed to the gross domestic product (GDP) from the exploitation of mines and quarries increased by only 0.2% compared with that of 2009 to about $2.97 million, or about 12% of the GDP. The average value of mining and quarrying for all years since 2000 was 13.4% of the GDP with a maximum of about 16% in 2004.

Government Policies and Programs

The Government of Ecuador had passed a mining mandate in April 2008 that called for a suspension of mineral exploration activities for 180 days or until a new mining act was approved and subsequently revoked about 75% of the greater than 4,000 mining concessions and 1,200 concession requests. Some of those concessions had been acquired by private interests beginning in the late 1980s when investor-friendly regulations were in place to promote foreign direct investment and exploration of the country's precious mineral occurrences. Ultimately, however, the regulations resulted in situations that were unsatisfactory to the citizens and the Government of Ecuador, including extensive speculation, unregulated artisanal mining, environmental damage, and a loss of revenue for the country.

A new mining act that was published in January 2009 and regulations created to govern the Mining Act that were issued in November 2009 became the new Mining Law (composed of the Mining Act and regulations). The new mining law places no limits on the number of mining concessions that an entity can hold, and the concessions have renewable 25-year term limits. Royalties of not less than 5% based on sales must be paid to the Government. Concise timelines are required to be followed for project exploration and development, and each company is required to establish production contracts with the Government that set out specific terms and conditions of the mining operation.

Two new agencies were formed as a result of mining sector reorganization, including the Ministry of Nonrenewable Natural Resources (MRNR) and the Agency for Regulation and Control of Mining (ARCOM). The two agencies were created to manage the nonfuel mineral, natural gas, and petroleum resources of the state. The database of mineral production statistics that had previously been published by the Ministry of Mines and Energy (MME) became available through the ARCOM in 2010, but the data were current only to 2007. On December 31, 2009, a new state mining company, Empresa Nacional Minera (ENAMI EP), was created by Executive decree (Dynasty Metals & Mining, 2011, p. 1–2).

Throughout 2010, some foreign companies were reportedly working out the details of individual contracts in order to proceed with development of their projects. It was reported that the Government would demand that some mining companies pay from $100 million to $200 million in royalties before they could begin extracting minerals and that mining companies might be required to pay up to 8% in royalties (Dynasty Metals & Mining, 2011, p. 1–2; Mineweb.com, 2011).

Production

Data on mineral production are in table 1. Since early 2008, it has been increasingly difficult or impossible to obtain any new information regarding nonfuel mineral production in Ecuador. Little or no exploration or production has been done by foreign companies.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Mineral Trade

Ecuador is a member of the Organization of the Petroleum Exporting Countries (OPEC) along with 11 other countries, all of whose petroleum reserves are orders of magnitude greater than Ecuador's. Ecuador had a negative account balance with OPEC in 2010 of $1.04 billion and remained the organization's smallest producer, in terms of volume, and the member with the least proven petroleum reserves. In 2010, the volume of crude petroleum exported from Ecuador increased by about 30% compared with that of 2009 to about 123 million barrels (Mbbl). Petroleum exports were valued at $9.65 billion and accounted for about 55% of the total exports in terms of value compared with 50% in 2009. About 10 Mbbl of petroleum products was exported in 2010 (Organization of the Petroleum Exporting Countries, 2011, p. 11).

Commodity Review

Metals

Gold.—Kinross Gold Corp. of Canada had continued to negotiate a production agreement with the Ecuadorean Government for its Fruta del Norte gold and silver project, submitted environmental impact assessments, and projected a startup date of late 2014. Total reserve and resource estimates included nearly 340,000 kilograms (kg) (reported as

11 million troy ounces) of gold and about 530,000 kg (reported as 17 million troy ounces) of silver (Kinross Gold Corp., 2011).

In January 2011, Dynasty Mining & Metals Inc. of Canada had applied to the MRNR to start negotiations that would complete a production contract for the company's Zaruma property. The company expected the contract to be finalized within 6 months after the application was accepted. Under the previous mining law, Dynasty had received permits to construct and operate a mill that would be capable of processing 500,000 metric tons per year (t/yr) of ore. By yearend, the company reported that the installed capacity of the plant, excluding a wet section, was about 800,000 t/yr (which would allow for expansion without incurring significant capital costs later) and that the target for the first steady state production level was 300,000 t/yr. The company tested the plant to near capacity during 2010 with a combination of resource and nonresource material stockpiled during mine development. It also completed its first export of about 190 kg (reported as 6,100 troy ounces) of gold to a Canadian refinery. By the end of 2010, the company had produced about 60 kg (reported as 1,850 troy ounces) of gold and about 800 kg (reported as 26,000 troy ounces) of silver contained in dore bars for which an estimated 5% royalty was to be paid to the Government. The total estimated resources for the Zaruma property included about 44,000 kg (reported as 1.4 million troy ounces) (Dynasty Metals & Mining Inc., 2011, p. 3–4).

In 2010 and into early 2011, Ecometals Ltd. of Canada's Condor gold, silver, and zinc project was being acquired by Ecuador Capital Corp. of Canada (ECC). ECC was created as a private exploration and mining company to acquire the Condor project. Upon completion of the acquisition, ECC was reportedly planning to list on the Toronto Stock Exchange and to change the company's name to Inca Gold Corp. When the deal was initiated, ECC was called Alca Gold Ltd., and during 2010, Alca Gold had requested an extension to the closing of the agreement. The Condor project's estimated reserves and resources included about 26,000 kg (reported as 825,000 troy ounces) of gold (Ecometals Ltd., 2010a, b; Cambridge House International Inc., 2011).

Mineral Fuels

Petroleum.—Foreign companies involved in petroleum production were affected by reforms to the country's Oil Law, which had nullified their previous production-sharing contracts. The new law requires the oil companies to negotiate service provider contracts under which the Government pays a fixed tariff to the companies that operate the oilfields and, in turn, receives all windfall profits from the field. Seven of 16 foreign oil companies operating in Ecuador were reported to have pulled out of the country; some of those that pulled out were operating in marginal oilfields (those that had already been exploited for 15 to 20 years) (Interpress Service News Agency, 2011).

Outlook

In 2010, very little information about nonfuel domestic exploration and (or) production in the country was available, but progress continued to be made in the organization of the mining industry. The MRNR released a national mining plan for the period from 2011 through 2015 that addresses the country's goal of developing a responsible mining industry. The plan provides information on areas of opportunity for development and programs that aim to accelerate the development of the mining sector, define mining areas and execute large-scale mining projects, eradicate illegal mining, and manage artisanal and small-scale mining projects in a responsible and socially profitable manner.

When, and whether or not, the country will be able to attract new investment in its mineral resources remains to be seen, as does the extent to which the mining industry will benefit the citizens, which was the justification for the reorganization of the industry. Ecuador may have lost a considerable amount of revenue during the global recession that started in 2008 compared with what might have been earned if near-term projects had been brought into production when gold prices were increasing. The companies that remained invested and in negotiations with the Government were working on large projects from which the country could recoup losses, provided those projects are brought into production in the foreseeable future and that demand and (or) prices for precious metals remains high in global markets; however, lengthy contract negotiations and large initial costs could be deterrents for some companies (Ministerio de Recursos Naturales no Renovables, 2011, p. 107).

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TABLE 1
ECUADOR: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010[e]
METALS					
Gold, mine output, Au content kilograms	5,168	4,587 [r]	800	500 [r, e]	1,300
Silver, mine output, Ag content do.	159	449	112	100 [r, e]	800
Steel, crude, continuously cast, electric furnace	85,000	87,000	128,000 [r, 3]	259,000 [r, 3]	372,000 [3]
INDUSTRIAL MINERALS					
Carbon dioxide (CO_2)	592	358 [r]	300 [r, e]	300 [e]	300
Cement, hydraulic[e] thousand metric tons	4,110	4,420	5,493 [3]	5,000	5,000
Clays (unspecified)	1,400 [r, e]	1,427 [r]	1,400 [r, e]	1,400 [r, e]	1,400
Feldspar	67,844	63,558 [r]	60,000 [r, e]	60,000 [r, e]	60,000
Gypsum, crude	1,478	-- [3]	-- [e]	-- [e]	--
Pozzolan	700,007	803,502 [r]	800,000 [e]	800,000 [e]	800,000
Pumice	150,000 [r, e]	153,500	100,000 [e]	100,000 [e]	100,000
Sand	36,208	33,907 [r]	35,000 [e]	35,000 [e]	35,000
Stone, sand and gravel:					
Limestone thousand metric tons	5,457	6,326 [r]	6,000 [r, e]	6,000 [r, e]	6,000
Marble	31,840	-- [3]	-- [r, e]	-- [r, e]	--
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic meters	1,309	1,196	1,200	1,200	1,275 [3]
Of which, marketable do.	680	830	680 [3]	600	600
Liquefied natural gasoline thousand 42-gallon barrels	300	299	300	300	300
Petroleum:[3]					
Crude do.	195,948	186,669	184,780 [r]	177,620	177,374
Refinery products:					
Liquefied petroleum gas do.	2,311	1,614	1,924	2,200	3,618
Gasoline[4] do.	7,273	7,311	17,090	18,600	17,786
Jet fuel do.	2,699	2,913	NA	NA	NA
Distillate fuel oil[5] do.	12,677	11,789	8,561	8,000	9,219
Residual fuel oil[6] do.	21,969	23,052	13,251	10,400	7,752
Asphalt do.	1,025	990	NA	NA	NA
Turpentine do.	35	45	NA	NA	NA
Solvents, including rubber solvent do.	41	62	NA	NA	NA
Other, including oils and lubricants[7] do.	5,310	4,447	12,267	15,100	12,341
Total do.	53,340	52,223	53,093	54,300	50,716

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto.

NA Not available. -- Zero.

[1] Table includes data available through October 4, 2011.

[2] In addition to the commodities listed, some additional construction materials are produced, including kaolin, sand and gravel, and sulfur, but available information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] Data for gasoline are reported as a sum total of two grades of gasoline—super and extra—for the years 2008 through 2010.

[5] Reported as Fuel Oil #4.

[6] Reported as Fuel Oil #6.

[7] Data for other refinery products for the years 2008 through 2010 were reported to include asphalt, jet fuel, turpentine, and solvents.

TABLE 2
ECUADOR: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement		Holcim Ecuador S.A. (Holcim Ltd., 92.1%, and other private, 7.9%)	Cerro Blanco plant, Guayaquil, Guayas Province, and San Rafael grinding plant, Latacunga, Cotopaxi Province	3,500
Do.		Cementos Selva Alegre S.A. (Lafarge S.A., 98.2%, and other private, 1.8%)	Cement plant near capital city of Quito, Pichincha Province	700
Gold		Dynasty Metals and Mining Inc., 100%	Zaruma gold mine in El Oro Province	800
Petroleum:				
Crude	thousand 42-gallon barrels	Petroproducción S.A. [Empresa Publica de Hidrocarburos del Ecuador (EP Petroecuador) (Government, 100%)]	About 26 active fields, led by Sacha, Sucumbios Province, and Shushufindi, Napo Province	127,700
Refinery products	do.	Empresa Publica de Hidrocarburos del Ecuador (EP Petroecuador) (Government, 100%)	Esmeraldas refinery, Esmaraldas Province	40,200
Do.	do.	do.	Libertad refinery, Guayas Province	16,800
Do.	do.	do.	Amazonas refinery and gas plant, Napo Province	7,300
Do.	do.	do.	Lago Agrio refinery, Sucumbios Province	375

[e] Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

THE MINERAL INDUSTRIES OF FRENCH GUIANA, GUYANA, AND SURINAME

By Alfredo C. Gurmendi

FRENCH GUIANA

French Guiana has been a French overseas Department since 1946, and as such is subject to French and European law. French Guiana's economy is dependent on that of France through trade and subsidies. In 2010, besides gold mining, other important industries in French Guiana were aerospace (mainly at the French space center in Kourou), fishing, and forestry. The mineral sector was administered by France. French Guiana's leading mineral commodity export was gold; the country imported chemicals, food, fuels, machinery, and transport equipment from France (IAMGOLD Corp., 2011a; U.S. Central Intelligence Agency, 2011).

Minerals in the National Economy

French Guiana's mineral resources included, in order of value, gold, petroleum, kaolin, niobium, tantalum, and clay. As of November 4, 2009 (the latest date for which information was available), the French authorities had not yet announced a new mining framework for French Guiana but had published a working document as a first step. In February 2009, the French Government declared a moratorium on all mining and exploration activities in French Guiana until a new "mining framework" was completed and assessed. This announcement suspended the granting of mining licenses pending the outcome of environmental reviews of exploration on all French Guiana concessions (U.S. Central Intelligence Agency, 2011).

IAMGOLD Corp. of Canada planned to work actively with Government officials and key stakeholders to develop a plan that would allow development of the Camp Caiman deposit, subject to appropriate restrictions and regulations (IAMGOLD Corp., 2011a).

The French Government, through the Prefect of French Guiana, released a new decision on August 26, 2010, however, which again denied a mining permit for the Camp Caiman project. IAMGOLD filed an appeal of this new decision on October 26, 2010, with the assistance of environmental experts (IAMGOLD Corp., 2011a, b).

Production

The leading mineral commodities produced in French Guiana in 2010 were cement, clays, crushed stone, gold, niobium and tantalum, and sand. Data on mineral production are in table 1.

Structure of the Mineral Industry

In recent years, the mineral industry of French Guiana had been focused on gold and petroleum exploration. Gold exploration was conducted by Golden Star Resources Ltd. of the United States. Golden Star held 100% interest in the Paul Isnard gold project for most of the year. The property is located in the western part of French Guiana, 200 kilometers (km) west of Cayenne and is accessible from St-Laurent-du-Maroni by air and road. The Paul Isnard project covers rocks of the lower Proterozoic Paramaka Formation, which contains gold mineralization in the form of pyritic disseminated zones and sulfide-rich shear zones. As of January 2009, Golden Star reported an inferred mineral resource estimate of 9.2 million metric tons (Mt) grading 2.5 grams per metric ton (g/t) gold at Montagne d'Or on the southern boundary of the Paul Isnard concession (Columbus Gold Corp., 2011, p. 10; Golden Star Resources Ltd., 2011).

Golden Star sold the Paul Isnard and other projects to Auplata S.A. of France on December 2, 2010. Auplata entered into a joint-venture agreement with Columbus Gold Corp. (CGC) of Canada to complete exploration and to develop the Paul Isnard gold project. Under the agreement, CGC had the right to earn an initial 51% interest in the Paul Isnard project during a 2-year period by incurring minimum exploration expenditures of $7 million, and by issuing common shares equal to 49% in a combination of Auplata (34%) and Pelican Venture SAS (Pelican) (15%). CGC could earn a 100% interest in Paul Isnard by completing a feasibility study during a 4-year period. On December 3, 2010, CGC entered into a final option agreement to acquire the Paul Isnard gold project, which includes the Montagne d'Or gold deposit, which is estimated to contain 2 million troy ounces of gold within 33.2 Mt of ore grading 1.69 g/t gold (Columbus Gold Corp, 2011, p. 10; Golden Star Resources Ltd., 2011; Reuters.com, 2011).

IAMGOLD held a 100% interest in the Camp Caiman gold development project, which is located 45 km southeast of Cayenne. According to the feasibility study for the Camp Caiman project, the deposit's proven and probable minable reserves as of January 2009 were estimated to contain 34.2 t (1.1 million troy ounces) of gold within 12.3 Mt of ore averaging 2.8 g/t gold; measured and indicated reserves were estimated to contain 49.8 t (1.6 million troy ounces) of gold within 20.4 Mt of ore averaging 2.5 g/t gold; and inferred reserves were estimated to contain 7.7 t (249,000 troy ounces) of gold within 3.8 Mt of ore averaging 2.1 g/t gold (IAMGOLD Corp., 2011a, b).

Commodity Review

Metals

Gold.—Gold exploration and investment activities in French Guiana were ongoing at projects with significant gold anomalies, such as the Wayamaga contact between the Armina and the Orapu formations and the Paul Isnard gold project. Extensive exploration has been conducted at Paul Isnard, including airborne topographic surveys, airborne geophysical surveys, metallurgical studies, and a soil geochemical survey. The planned budget at Paul Isnard was $8.5 million in 2011 for a two-phase drilling program. The planned resource confirmation and potential expansion within the Montagne d'Or gold deposit were to take place in the second half of 2011 (Columbus Gold Corp, 2011, p. 17).

IAMGOLD was planning to develop the Camp Caiman gold deposit using an open pit mining method. The mill would process 5,500 metric tons per day (t/d), or more than 2 million metric tons per year (Mt/yr), of ore, subject to the mining and milling capacities for the diverse categories of gold in the estimated reserves and resources (IAMGOLD Corp., 2011a, b).

Mineral Fuels

Petroleum.—In South America, Tullow Oil plc of the United Kingdom had interests in the prospective Guyana Basin, which includes French Guiana, Guyana, and Suriname. According to Tullow, the Guyana Basin offers significant frontier exploration opportunities, including geologic structures that are similar to those of the Jubilee field of Ghana across the Atlantic Ocean. Tullow had collected more than 9,000 km of two-dimensional (2-D) seismic data and 380 km of three-dimensional (3-D) seismic data in the basin's Guyane Maritime portion block to advance a number of known leads to drillable prospect stage. Tullow's drilling program in an area of 2,500 square kilometers (km^2) was based on the 3-D seismic data completed in March 2010. Processing and interpretation of the drilling data were to take place during 2010. In the fourth quarter of 2009, Tullow entered into a joint-venture agreement with two new partners in the French Guiana acreage—Royal Dutch Shell plc of the Netherlands (45%) and the Total S.A. of France (25%)—which left Tullow with a 27.5% interest and the Northern Petroleum Plc of the United Kingdom with the remaining 2.5%. The joint venture was formed in preparation for high-impact drilling, which was planned to commence on the Zaedyus prospect in March 2011. The assignment of interests to both Shell and Total was, however, awaiting formal approval from the French Government. Tullow was also drilling a strategic deepwater basin-testing well on the Zaedyus prospect (Tullow Oil plc, 2011, p. 5, 34, 157).

Outlook

A new mining framework has not yet been presented by the Government, but a working document was made available in early 2009, which provides for a consultative process in which investors are active participants. Once the new mining framework is in place, gold exploration and investment activities in French Guiana will likely move forward at projects with significant gold anomalies, such as the Wayamaga contact between the Armina and the Orapu formations where Golden Star has outlined a potential for gold resources. Columbus Gold and IAMGOLD are also likely to move forward with their Paul Isnard and Camp Caiman gold projects, respectively (Columbus Gold Corp., 2011, p. 17; IAMGOLD Corp., 2011a).

Tullow's petroleum exploration projects are expected to progress and expand through new ventures, portfolio management, license rounds, and exploration. The evaluation of data collected in 2009 will continue in 2010, and key exploration campaigns are planned for 2011 (Tullow Oil plc, 2011, p. 5).

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GUYANA

Guyana's gross domestic product (GDP) based on purchasing power parity increased to $6.4 billion in 2010 from $5.2 billion in 2009, or by almost 23.1%. This increase was in spite of the effects of the global financial crisis and was attributed to positive performances in the services, construction, transportation, and communication sectors. The agriculture and manufacturing sectors also recorded positive growth whereas the mining and quarrying sector contracted because of reduced production of bauxite, which decreased by 24%, and diamond, which decreased by 65.3%; gold output, however, increased by almost 1.1% (table 1). Inflation was 6.8% in 2010 compared with 2.9% in 2009 owing to rising food prices. The value of Guyana's exports was estimated to be about $814 million in 2010; exports included such commodities as bauxite and alumina, food products, gold, and timber. Guyana's export partners included Canada (27.5%), the United States (17%), the United Kingdom (10.8%), the Netherlands (5%), Trinidad and Tobago (4.3%), Jamaica (4.1%), and others (31.3%). Imports were valued at nearly $1.4 billion and included such products as food, machinery, manufactures, and petroleum. Guyana's import partners included the United States (25.2%), Trinidad and Tobago (23.2%), Cuba (6.4%), and China (6.1%) (Bank of Guyana, 2011, p. 7, 9, 15; U.S. Central Intelligence Agency, 2011).

Minerals in the National Economy

Output in the mining sector decreased by 6.9% owing to decreases in the production of bauxite and diamond and despite an increase in gold output. Bauxite production decreased to 1.1 Mt in 2010 from 1.4 Mt in 2009, reflecting the decrease in world demand and falling prices. Diamond production decreased to 49,920 carats in 2010 from 143,982 carats in 2009. Gold production increased slightly to 9,594 kilograms (kg) in 2010 from 9,492 kg in 2009 owing to high gold prices and increased production by small- and medium-scale miners. Bauxite and gold were the country's major mineral exports (table 1; Bank of Guyana, 2011, p. 10).

Government Policies and Programs

According to Canada-based Sacre-Coeur Minerals, Ltd., Guyana has been friendly towards foreign investment, particularly to investment in natural resource development, during the past decade. General business, mining, and tax laws are well developed and uniformly administered, including duty-free and tax-free import privileges for mining equipment. Several major successful natural resource ventures were commissioned by foreign investors in the past 10 years, including the world-class Omai gold mine, which was a joint venture of two North American mining companies, IAMGOLD and Golden Star (Sacre-Coeur Minerals Ltd., 2011b).

In Guyana, all mineral rights are vested in the State. The Guyana Geology & Mines Commission (GGMC) is the Government agency that regulates all activities in the Mines Division and Petroleum Division in accordance with the Mining Act of 1989. The GGMC examines Guyana's mining concessions, mining and prospecting permits and licenses, and quarry licenses; it also promotes mineral development and performs mineral exploration. The Mines Division of the GGMC provides services to the mining sector. Mining licenses, which are issued in the production phase, are granted for a period of 20 years and can be renewed indefinitely. Operating plans must be filed with the the GGMC. Annual dues are progressive, beginning at \$0.50 per acre and increasing to a maximum of \$3.00 per acre over 6 years during the prospecting phase. Once production begins, the prospecting license must be converted to a mining license, and the annual dues increase to \$5.00 per acre. Gold production from all types of mineral concessions in Guyana is subject to a statutory 5% net smelter return royalty, payable to the Guyana Gold Board. From time to time, the Government of Guyana has reduced this royalty/severance tax to a lesser figure during periods of low gold prices and under individually negotiated tax concessions to motivate development of major mineral projects (Guyana Geology & Mines Commission, 2011; Sacre-Coeur Minerals Ltd., 2011a).

The Petroleum Division regulates all activities in the crude oil industry; provides timely economic, environmental, and technical advice; and supports competitiveness and efficiency in the petroleum sector. The GGMC issues three types of licenses: the petroleum prospecting license, which is issued for a period of 4 years, with two optional renewals to extend the exploration period for 3 more years each; the petroleum production license, which runs for 20 years; and the production-sharing agreement, which offers such incentives as a 75% cost recovery, 50% profit share, and 10% reduced consumption tax on fuel for petroleum exploration operations, among other incentives (Guyana Geology & Mines Commission, 2011).

Production

In 2010, Guyana continued to be a significant industrial minerals producer in the world. The production of bauxite decreased to 1.1 Mt in 2010 from about 1.4 Mt in 2009, or by about 24%. The production of diamond decreased by almost two-thirds; gold production increased slightly to 9,594 kg from 9,492 kg in 2009, or by nearly 1.1%; production of construction materials increased, and production of crushed stone and sand increased by more than 51% and 36%, respectively (table 1; Bank of Guyana, 2011, p. 10; Bray, 2011).

Structure of the Mineral Industry

Table 2 is a list of the major mineral industry facilities in Guyana. The table provides the location and production capacities of these facilities. Bosai Minerals Group Co., Ltd. (BMG) (also known as Nanchuan Minerals Group Co., Ltd.) was a leading privately owned corporation that was based in Chongqing, China. BMG's subsidiary Bosai Minerals (Guyana) Inc. operated a bauxite mine and processing operation in Linden, Guyana. This operation produced the well-known RASC refractory bauxite, as well as chemical and cement grades. The operation's annual production amounted to 600,000 t in 2010. These grades of bauxite were exported worldwide by Bosai Minerals. BHP Billiton Ltd. of Australia and Goldstone Resources Inc. of the United Kingdom were interested in exploring laterites for a source of bauxite. Guyana Goldfields Inc. (a Canada-based junior mineral exploration company primarily focused on the exploration and development of gold deposits in the Guiana Shield in South America) was undertaking technical studies to advance and develop the Aurora gold project in Guyana. Sacre-Coeur Minerals was engaged in the acquisition, exploration, and development of properties for the potential mining of diamond and gold in the Guiana Shield, initially focusing on exploration for gold on its properties in Guyana (Guyana Goldfields Inc., 2011; Nanchuan Minerals Group, 2011; Sacre-Coeur Minerals Ltd., 2011b).

Commodity Review

Metals

Bauxite and Alumina.—In 2010, the value of exports of bauxite increased to \$114.6 million from \$79.5 million in 2009. The increase was owing to the significant increase in the export price to \$100.9 per metric ton in 2010 from \$56.5 per metric ton in 2009 for metallurgical-grade bauxite used for the production of alumina (table 1; Bank of Guyana, 2011, p. 15–16; Bray, 2011).

According to the GGMC, feasibility studies were to be conducted for an alumina plant with a capacity of at least 250,000 metric tons per year (t/yr), a hydroelectric plant, and a smelter. For that purpose, the Guyana Government and United Company RUSAL of Russia entered into a letter of intent to conduct the feasibility studies, which could start by the end of 2011. The Omai bauxite mine contains estimated reserves of 200 Mt. Bosai Minerals' target for production was planned to be 400,000 t/yr of calcined alumina. Also, BHP Billiton and Goldstone Resources were planning to evaluate the Pakaraima laterites as a source of bauxite feed for an alumina plant (Guyana Geology & Mines Commission, 2011).

Gold.—In 2010, the increase in gold production in Guyana was owing to consistently active mining by small- and medium-scale miners that benefited from the continued increase in gold prices on the international market. Guyana's gold exports amounted to $346.2 million, which was 23% higher than in 2009. This increase was owing to higher export prices. The average export price per troy ounce of gold increased by more than 26.7% to $1,144.6 per troy ounce from $903.1 per troy ounce in 2009. The export volume, however, decreased by 3% to 302,654 troy ounces (9.4 t) from 311,884 troy ounces (9.7 t) in 2009 (Bank of Guyana, 2011, p. 15–16).

Guyana Goldfields' principal interest was in its Aurora gold property, where the company continued to conduct exploration and development work. The Aurora property consists of a number of gold deposits, which are located on the eastern side of the Aurora zoned intrusion in the Cuyuni greenstone belt of the Guiana Shield in the Amazon Craton. Guyana Goldfields planned to begin the first year of production at the Aurora gold project by 2013 and to produce an average of 7,776 kilograms per year (250,000 troy ounces per year) during a 17-year mine life with an operating cash cost of $364 per troy ounce. Guyana Goldfields expected that the Aurora gold project would be a large, highly profitable world-class gold mine which would be developed and come online in the next 3 years. On January 28, 2009, Guyana Goldfields acquired the Aranka gold property, which is located 30 km northeast of the Aurora area and had 19 contiguous prospecting licenses. The Aranka gold project was in the prospecting and exploration stage. Current activities included field mapping, geochemical sampling, and testing of potential zones by trenching and exploratory drilling (Guyana Goldfields Inc., 2011).

Sacre-Coeur held six gold permits—the Kartuni regional block, the Kurupung regional block, the Lower Puruni regional block, the Million Mountain property, the Northwest regional block, and the Potaro-Kuribrong regional block. The Million Mountain area and the adjacent Peters Mine area are one of Guyana's gold mining centers. Owing to the drilling conducted in and around the Peters Mine's main open pit and the Million Mountain Block, seven new highly prospective targets for gold mineralization were identified; each of these new zones is characterized by a silica-rich intrusive body intruded into brittle greenstones (Sacre-Coeur Minerals, Ltd., 2011b).

Infinito Gold Ltd. of Canada held 100% interest in the Marudi Mountain gold project, which is divided into the following four zones: the Marudi Ridge, the Mazoa, the Paint Mountain Ridge, and the Peace Creek-Toucan Hill. Infinito Gold had an agreement with Shoreham Resources Ltd. of Canada to accelerate the development of the Marudi Mountain and Paint Mountain gold prospects. Shoreham would earn 75% interest upon completing $4 million in exploration during 4-year period, and Infinito Gold would hold 25% interest in the joint venture if a mine is developed (Infinito Gold Ltd., 2011).

Industrial Minerals

Diamond.—In 2010, diamond production in Guyana decreased to 49,920 carats from 143,982 carats in 2009 (table 1) as a result of mining more gold than diamond and owing to relatively low prices on the global market for diamond. During 2009–10, two Canada-based companies were actively prospecting for diamond in Guyana—Infinito Gold and Sacre-Coeur. Infinito Gold held interest in the Maple Creek and the Potaro projects. In 2010, the Maple Creek project produced a small amount of diamond. Infinito Gold had an agreement with Shoreham for the Potaro diamond prospect to acquire 100% interest in return for cash and a gross overriding royalty. Sacre-Coeur held prospecting permits for the Kurupung River region, which is an important historic diamond producer in Guyana; the Potaro-Kuribrong regional block, which is located in north-central Guyana; and a claim permit and claim license in the Mahdia-Issano regional block, which is located in northwestern Guyana (Infinito Gold Ltd., 2011; Olson, 2011; Sacre-Coeur Minerals, Ltd., 2011b).

Mineral Fuels and Related Materials

Petroleum and Natural Gas.—CGX Energy Inc. is a Canada-based oil and gas exploration company focused on the exploration for oil in Guyana. ON Energy Inc. (a public company registered in Guyana) was owned by CGX (62%) and local investors (38%). CGX held interest in 39,659 km² (9.5 million acres) offshore Guyana. The company had interest in the following four offshore properties: the Corentyne License Annex, the Corentyne License, and the Pomeroon License (100% ownership in each); and the Georgetown License (25% interest). Onshore, the company had a 62% interest in the Berbice License. Several significant targets identified in the Corentyne Petroleum Prospecting License (PPL) included the Eagle prospect, which covers 117.4 km² (29,000 acres) and had an estimated potential resource of 610 million barrels (Mbbl) of oil, and the Wishbone West prospect, which had an estimated potential resource of more than 100 Mbbl of oil. Because of disputes concerning the offshore border between Guyana and Suriname, however, particularly the longstanding dispute with Suriname about the axis of the territorial sea boundary in potentially oil-rich waters, restrictions on access to a portion of the contracted area in the Corentyne PPL was extended to June 2013 (CGX Energy Inc., 2011b).

In June 2010, the partners to the Georgetown Block, which included Repsol Exploration S.A of Spain (Repsol) (operator), Tullow Guyana B.V. of the United Kingdom, and CGX contracted the *Atwood Beacon* jack-up drilling rig (operated by Atwood Oceanics Pacific Ltd.) to drill a well on the Georgetown Block offshore Guyana at a per-day operating rate of about $115,000. Also, CGX intended to drill two exploratory wells offshore Guyana—the Jaguar-1 well on the Georgetown Block and the Eagle-1 well on the Corentyne PPL.

CGX's portion of the costs associated with the drilling of the Jaguar-1 well was estimated to be between $30 million and $40 million, and the cost of drilling the Eagle-1 well was estimated to be about $40 million (CGX Energy Inc., 2011a, p. 7–9).

In November 2009, Tullow had added to its portfolio of South American projects through the acquisition of a 30% interest in the Georgetown Block from Repsol YPF S.A. of Spain. The block covers 11,100 km² in water depths of 50 to 200 meters (m) and has geologic characteristics similar to those of French Guiana and to proven basins on the other side of the Atlantic. An extensive 3-D seismic survey of the Georgetown Block was completed early in 2009. The data had been processed and interpreted and a number of stratigraphic trap prospects of the Upper Cretaceous and Tertiary Periods had been identified. Drilling of a first exploratory well was expected to begin by the end of 2010 (Tullow Oil plc, 2011, p. 53).

According to the GGMC, four additional companies were licensed to undertake exploratory work in Guyana: Century Guyana Ltd., CGX, Exxon Mobil Corp. of the United States, and Repsol YPF. Other companies interested in the Guyana's petroleum sector included CGX's ON Energy and Groundstar Resources Ltd. of Canada, and Sadhna Petroleum Inc. of Trinidad and Tobago. ExxonMobil planned to commence seismic work to determine whether drilling should take place offshore. Sadhna was to drill several wells along the coastal areas of Berbice and Demerara in the Takutu basin in the Rupununi; the GGMC would drill at three places in the northwest that had historical reports of gas emissions. The GGMC also anticipated that Groundstar Resources would be doing work in the Takutu basin, and that ON Energy would be drilling in Berbice and Canje; CGX would also be doing work offshore (Guyana Geology & Mines Commission, 2011).

Uranium.—U3O8 Corp. of Canada obtained exclusive uranium exploration rights from the GGMC for two permitted areas in western Guyana (the Roraima basin and the Kurupung Batholith) for a total of 1.3 million hectares. Under the agreement with the GGMC, U3O8 Corp. had the right to apply for a maximum of 35 prospecting licenses. U3O8 Corp. was focusing on the Roraima basin; the company considered the Roraima basin to be geologically similar to the Athabasca Basin, which contains the world's largest known resource of uranium and accounts for 20% of world's uranium production. U3O8 Corp. expected to start drilling the most promising areas of the Roraima basin in 2010. U3O8 Corp. had also defined an initial NI 43–101 uranium resource in the Kurupung Batholith, which contains 5.8 million pounds, or 2.6 Mt, of equivalent yellow cake—uranium concentrate (U_3O_8) at 0.100% (indicated reserves) and 1.3 million pounds, or 590,000 t, of U_3O_8 at 0.090% (inferred resources) (U3O8 Corp., 2011).

Outlook

Production of bauxite, diamond, and gold will likely continue to be dominant commodities in Guyana's mining sector. Bosai Minerals expects to produce 600,000 t/yr of calcined alumina. Prospecting for diamond is likely to continue in the Kurupung River and the Maple Creek region, which are important historic diamond producers, and in the Potaro-Kuribrong regional blocks, which are located in north-central Guyana. Gold exploration activities are likely to continue as a result of several gold exploration projects that progressed in 2010. Uranium exploration in the Roraima basin and the Kurupung Batholith in western Guyana will likely intensify. The future plans of Prometheus Resources (Guyana) Inc. (a subsidiary of U3O8 Corp.) in Guyana include a detailed exploratory program in its uranium permit areas. Offshore hydrocarbon exploration in Guyana will likely increase because of the progress in the resolution of the maritime boundary disputes between Guyana and Suriname (Guyana Geology & Mines Commission, 2011; U3O8 Corp., 2011).

According to the GGMC, there are some indications of the presence of natural gas on the two Essequibo Islands of Leguan and Wakenaam. Study and analysis would need to be carried out to determine if the findings are commercially feasible, however. Also, the GGMC foresees positive prospects for the production of biodiesel, ethanol, and hydropower. ESSAR Steel Group of India is building a large steel mill in Trinidad and Tobago and is working with the GGMC to evaluate various potential iron ore bodies in Guyana. The GGMC is also working with ESSAR to reevaluate potential manganese ores in Guyana and whether any iron or manganese could be found to be used in its steel mill in Trinidad and Tobago (Guyana Geology & Mines Commission, 2011).

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SURINAME

In 2010, Suriname's mineral activities included the mining of bauxite; the refining of alumina; the production of cement, gold, iron ore, and petroleum and byproducts of copper, nickel, and platinum; and the quarrying of clays, sand and gravel, and stone. Suriname has an interesting mining history; its role as one of the leading bauxite and alumina producers in the world spans more than 90 years. The country's leading petroleum producer was the Government-owned Staatsolie Maatschappij Suriname N.V., which was founded on December 13, 1980, as a limited-liability company under Surinamese law. Since then, with the creation of Staatsolie and the introduction of joint ventures between the public and the private sectors, the petroleum industry has continued to develop (Staatsolie Maatschappij Suriname N.V., 2011; U.S. Central Intelligence Agency, 2011).

Minerals in the National Economy

In Suriname, mineral production has been focused on alumina, bauxite, gold, and petroleum. The country's economy was dominated by the mining industry, with exports of alumina, gold, and petroleum accounting for about 85% of exports; thus, the economy was highly vulnerable to mineral price volatility. In 2010, the petroleum sector's financial performance was $355 million with a net profit of $225 million and a contribution to the Government's budget of $150 million. Suriname's total exports, among which were included such mineral commodities as alumina, gold, and crude oil, were valued at about $1.4 billion. Suriname's export partners in 2010 included Canada (35.5%), Belgium (15%), the United States (10.2%), the United Arab Emirates (10%), Norway (4.9%), the Netherlands (4.7%), France (4.5%), and others (15.2%). Imports in 2010 were valued at about $1.3 billion and included such products as capital equipment, foodstuffs, and petroleum. Suriname's import partners included the United States (30.8%), the Netherlands (19.2%), Trinidad and Tobago (13%), China (6.8%), Japan (5.9%), and others (24.3%) (Staatsolie Maatschappij Suriname N.V., 2011; U.S. Central Intelligence Agency, 2011).

Production

In 2010, the production of alumina decreased to about 1.1 Mt from more than 1.9 Mt in 2009, or by more than 44%; bauxite production decreased to 4.0 Mt from 5.2 Mt in 2009, or by more than 23%. The production of crude petroleum in 2010 remained at about the same level as that of 2009; production of petroleum derivatives in 2010 was also at about the same level as in 2009. Data on mineral production are in table 1.

Structure of the Mineral Industry

In 2010, the main bauxite-alumina operators in Suriname were Alcoa Inc. of the United States and Alumina Ltd. of Australia. On July 31, 2009, Alcoa World Alumina and Chemicals (AWAC), which was the world's leading bauxite-alumina-aluminum producer, acquired BHP Billiton's 45% share of Suriname Aluminum Co.'s (Suralco's) 55% interest in the Surinamese bauxite mining and alumina refining joint ventures. Suralco was owned by Alcoa (60%) and by Alumina (40%). AWAC activities involved bauxite mining, alumina refining, and selected smelting facilities located in Australia, Brazil, Guinea, Jamaica, Spain, Suriname, and the United States (Alcoa Inc., 2011a, c; Alumina Ltd., 2011; BHP Billiton plc, 2011, p. 70–71; Bray, 2011). Table 2 is a list of the major mineral industry facilities in Suriname.

Commodity Review

Metals

Bauxite and Alumina.—In 2010, the production of alumina decreased to about 1.1 Mt from almost 2.0 Mt in 2009. Production operations in Suriname included two bauxite mines and one alumina refinery. The country's open pit bauxite mines were the Coermotibo and the Moengo. The Coermotibo project is located 23 km southeast of Paramaribo (the capital of Suriname) and 11 km east of the Paranam refinery. The mine was scheduled to be operational by August 2011. The Coermotibo Mine is located 38 km southeast of Paramaribo and 24 km east of the Paranam refinery. The Moengo Mine was not operating at its production capacity of 2 Mt/yr of bauxite owing to market conditions for alumina (table 1; Alcoa Inc., 2011b–d; BHP Billiton plc, 2011; Bray, 2011).

Alcoa managed the Afobaka hydroelectric facility and the Paranam alumina refinery operations in Suriname. With its 2.2-Mt/yr alumina refinery and 100-megawatt (MW) hydroelectric facility, Suralco was the leading private enterprise in Suriname and a key supplier of alumina to Alcoa facilities and markets throughout Europe and the United States (Alcoa Inc., 2011a, d).

Gold.—In 2010, Rosebel Gold Mines N.V. (RGM) was owned by IAMGOLD Corp. (95%) and the Government of Suriname (5%). The Rosebel Mine is located in the Brokopondo mineral district, approximately 100 km south of Paramaribo. Gold mineralization at the Rosebel deposit is associated with north-dipping quartz and quartz-carbonate veins and pyrite alteration localized along shear corridors developed at contacts between sandstone and siltstone units in the Rosebel formation. The mining permit was granted until 2027. In 2010, mining at Rosebel was carried out at the following five open pits, in order of volume—the Royal Hill, the Pay Caro, the East Pay Caro, the Koolhaven, and the Mayo. The following three additional open pits were planned to be in production by 2015, in order of volume—the Rosebel, the Roma, and the J-Zone. Mining would continue to be by conventional open pit methods, using shovels and trucks. The mining and processing facilities included an 11-Mt/yr-capacity mill, which included crushing and grinding, and gravity separation; a cyanidation circuit; and a carbon-in-leach plant (IAMGOLD Corp., 2011a–d).

In 2010, Rosebel produced 12,286 kg of gold compared with 12,193 kg in 2009, which was a less than 0.8% increase (table 1). On December 31, 2010, Rosebel's proven and probable gold reserves amounted to 172 Mt grading 1.1 g/t and containing 183.3 t (5.9 million troy ounces) of gold; measured and indicated resources were 232 Mt grading 1 g/t and containing 234.2 t (7.5 million troy ounces) of gold; and inferred resources were 17.6 Mt grading 1.1 g/t and containing 18.9 t (609,000 troy ounces) of gold, which was sufficient for a mine life to 2022 (IAMGOLD Corp., 2011c).

In 2010, Golden Star Resources sold its joint venture interest in the Saramacca gold project to Newmont Mining Corp. of the United States for approximately $8 million. The Government approved the transfer of the concession. Saramacca's extensive gold anomaly in eastern Suriname ranges from 12 to 15 km along the northern flank of the Brokolonko Range and extends to the southwest of the Gross Rosebel property (Golden Star Resources Ltd., 2011).

According to Newmont, the Guiana Shield remains a highly prospective area for new gold discoveries. Relatively new gold discoveries included Cassador and Saramacca in Suriname. Strong preliminary tests show multimillion tonnage resource target potential at Cassador (Newmont Mining Corp., 2011, p. 12).

Mineral Fuels

Petroleum and Natural Gas.—Staatsolie Maatschappij Suriname N.V., which was owned by the Government of Suriname, was engaged in exploration, drilling, production, refining, marketing, sales, transport, and generation of electricity and steam. Staatsolie's leading crude oilfields were, in order of value, Tambaredjo and Calcutta. In 2010, Staatsolie's refinery processing capacity was 7,000 barrels per day (bbl/d) of crude oil. Staatsolie's refinery products included, in order of value, diesel, fuel oil, and asphalt bitumen. Most of these derivatives were consumed in the local market and the surplus was exported to the Caribbean. Staatsolie actively promoted the hydrocarbon potential of Suriname, and monitored petroleum agreements on behalf of the Government (Staatsolie Maatschappij Suriname N.V., 2011).

Staatsolie's petroleum operations began onshore in the Saramacca District, which is located 55 km west of the capital, Paramaribo. In 2010, the company's crude production from the Calcutta and the Tambaredjo oilfields totaled 5.4 million barrels. The majority of the production was from the Tambaredjo field. In the neighboring Calcutta field, full-scale production activities continued in 2010. Staatsolie's exploration strategy was driven by its objective to increase onshore crude production to 16,000 bbl/d by 2012. In early 2010, proven reserves were 13 Mbbl in the Calcutta field, 57 Mbbl in the Tambaredjo field, and 18 Mbbl in the Tambaredjo North-West area (Staatsolie Maatschappij Suriname N.V., 2011).

Staatsolie also supplied power to Suriname. A 14-MW powerplant at Tout Lui Faut had been in operation since July 2006. The Tout Lui Faut refinery used the steam that the powerplant generated. The electricity was sold to the local power company for further distribution within the country. The powerplant was to be incorporated as a separate entity named Staatsolie Power Company Suriname N.V. by early 2012 (Staatsolie Maatschappij Suriname N.V., 2011).

In South America, Tullow had exploration interests in the prospective Guyana Basin (which included French Guiana, Guyana, and Suriname) with a total acreage of 46,238 km^2; Tullow had secured equity in the Guyana Georgetown Block in 2008 and Block 47 offshore Suriname in 2010. A production-sharing contract for the block was expected to be finalized and would enhance Tullow's portfolio of exploration areas in the emerging Suriname-Guyana Basin. Tullow planned to acquire seismic data during 2011 and anticipated that wells would be drilled as part of its medium-term exploration program in the Equatorial Atlantic region of South America. Tullow planned to operate the license full time and to finance it during the exploration phase. Staatsolie, however, had the option to participate during the development and production phases by contributing 20% of the total cost (Tullow Oil plc, 2011a, p. 5, 22; 2011b).

Outlook

New gold discoveries included Cassador and Saramacca in Suriname. Strong preliminary tests show multimillion tonnage resource target potential at Cassador. Newmont's exploration will likely be carried out on its Saramacca gold project in Suriname, which lies within the same geologic-structural region as the adjacent Rosebel Mine. Rosebel's gold production in the years ahead is expected to increase owing to its investments in resource delineation, mine exploration programs, and additional leach tanks to improve recoveries. IAMGOLD is expected to launch an $18.4 million mill expansion project that would increase its annual production capacity to between 9.3 and 9.5 t (300,000 and 305,000 troy ounces) from its current (2010) capacity of about 8.6 t (275,000 troy ounces), and reduce direct cash costs by approximately $35 per ounce. The mill expansion is expected to increase mill feed to 8.9 Mt/yr of ore from 8 Mt/yr and to provide the option of an additional 15% to 25% increase of gold output should market conditions be appropriate (IAMGOLD Corp., 2011b, c; Newmont Mining Corp., 2011, p. 12).

The alumina industry in Suriname is expected to grow with the completion of the $65 million 250,000-t/yr expansion of the Paranam facility that supports alumina storage, refining, shipping facilities, thermal power, and the head office of Suralco (Alcoa Inc., 2011a, c).

Crude petroleum production in Suriname is expected to continue to increase. Staatsolie's exploration strategy is driven by its objective to increase onshore crude production to 16,000 bbl/d by 2012 (Staatsolie Maatschappij Suriname N.V., 2011).

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TABLE 1

FRENCH GUIANA, GUYANA, AND SURINAME: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Country and commodity		2006	2007	2008	2009	2010[e]
FRENCH GUIANA[e]						
Cement	metric tons	62,000	62,000	62,000	62,000	62,000
Clays	do.	5,000	5,000	5,000	5,000	5,000
Columbite and tantalite	kilograms	1,500	1,500	1,500	1,500	1,500
Gold, mine output, Au content[2]	do.	2,000	2,000	2,000	2,000	2,000
Sand		1,500	1,500	1,500	1,500	1,500
Stone, crushed		1,500	1,500	1,500	1,500	1,500
GUYANA[3, 4]						
Bauxite, dry equivalent, gross weight		1,479	2,243	2,092	1,448 [r]	1,100 [5]
Diamond	carats	340,544	268,945	168,926	143,982 [r]	49,920 [5]
Gold, mine output, Au content	kilograms	5,668	7,412	8,131	9,492 [r]	9,594 [5]
Sand	metric tons	285,000	285,000	290,000	478,572 [r]	652,175 [5]
Stone, crushed	do.	204,000	204,000	204,000	340,016 [r]	514,932 [5]
SURINAME						
Aluminum:						
Bauxite, gross weight		4,924 [6]	5,054	5,200	5,200 [r]	4,000
Alumina		2,153 [7]	2,270 [7]	2,153	1,953	1,083 [5]
Cement, hydraulic[e]		65	65	65	65	65
Clays, common[e]		20	20	20	20	20
Gold, mine output, Au content[8]	kilograms	9,362	9,360	9,798	12,193	12,286 [5]
Petroleum:[e]						
Crude[9]	thousand 42-gallon barrels	4,800	4,800	5,600	5,650	5,700
Products	do.	2,500 [9]	2,500	2,917 [5]	2,943 [5]	2,940
Sand and gravel:[e]						
Gravel		35	35	35	35	35
Sand, common		160	160	160	160	160
Stone, crushed and broken		50	50	50	50	50

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto.

[1] Table includes data available through May 31, 2011.

[2] Source: Direction Regionale de l'Industrie, de La Recherche et de l' Environment and Bureau de Recherches Géologiques et Minières.

[3] In addition to the commodities listed, Guyana also reported laterite production, in metric tons: 2006—12,000, and 2007 through 2010—NA and loam production, in metric tons: 2006—4,000; and 2007 through 2010—21,017.

[4] Source: Guyana Geology and Mines Commission, the Bank of Guyana, and Minerals Questionnaire 2009 and 2010.

[5] Reported figure.

[6] Source: World Bureau of Metal Statistics.

[7] Source: BHP Billiton Group.

[8] Source: IAMGOLD Corp.

[9] Source: Staatsolie Maatschappij Suriname N.V.

TABLE 2
GUYANA AND SURINAME: STRUCTURE OF THE MINERAL INDUSTRIES IN 2010

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
GUYANA				
Bauxite		Aroaima Bauxite Co. (United Company RUSAL, 90%, and Government, 10%)	Kwakwani, East Berbice District	2,000
Do.		Bosai Minerals (Guyana) Inc. (Bosai Minerals Group, 70%, and Government of Guyana, 30%)	Omai bauxite mine and processing plant located close to Linden on the Demerara River about 100 kilometers south of Guyana's capital city of Georgetown	1,200
Diamond	carats	Infinito Gold Ltd.	Maple Creek Mine, Kurupung region	145,000
Gold	kilograms	Guyana Goldfields Inc.	Aurora Mine, Cuyuni	10,000
Gravel		Baracara Quarries (private)	Quarry near Bartica, Mazaruni-Potaro District	100
Silica sand		Minerals and Technology Ltd. [Minerals and Chemicals of Texas (United States)]	Sand Hills, Demerara River, West Demerara District	300
Stone		Mazaruni Granite Products Inc. of Guyana (private)	Mazaruni River	3,650
SURINAME				
Alumina		Suriname Aluminum Co. (Suralco) (Alcoa, Inc., 60%, and Alumina Ltd., 40%)	Refinery at Paranam, produces metallurgical-grade alumina	2,200
Bauxite		do.	Coermotibo Mine, open pit mine, 23 kilometers southeast of Paramaribo; to commence in May 2007	2,000
Do.		do.	Moengo Mine, open pit mine, 38 kilometers southeast of Paramaribo; operations started in July 2006	2,000
Cement		Vensur N.V. (private, 100%)	Paramaribo, District of Para	60
Gold	kilograms	Rosebel Gold Mines N.V. (IAMGOLD Corp., 95%, and Government of Suriname, 5%)	Brokopondo District, 100 kilometers south of Paramaribo	12,500
Petroleum	thousand 42-gallon barrels	Staatsolie Maatschappij Suriname N.V. (Government, 100%)	Tambaredjo, District of Saramacca	4,500
Do.	do.	do.	Calcutta field (58 wells)	460
Petroleum products	do.	do.	Tambaredjo, District of Saramacca	2,600

Do., do. Ditto.

THE MINERAL INDUSTRY OF GUATEMALA

By Steven T. Anderson

Mineral deposits of barite, copper, gold, lead, nickel, silver, and zinc have been discovered in Guatemala, and coal, cobalt, copper, gold, iron ore, limestone, nickel, petroleum, sand and gravel, tin, and uranium have been identified as minerals that could provide investment potential for further exploration and development in the country. In 2010, gold production continued to account for the leading share (46%) of the total value[1] of mineral production in Guatemala compared with a share of about 43% in 2009; production of crude petroleum continued to account for the second ranked share (35%) in 2010, although this was a notable decrease from the second ranked share of about 42% in 2009; and silver production accounted for the third ranked share of about 17% in 2010, which was an increase from the third ranked share of 10% in 2009. Guatemala's production appeared to account for less than 1% of the world's production for each of the minerals produced in the country during 2009 and 2010 (KPMG Consultores S.A., 2010, p. 12–14; Agencia de Promoción de Inversiones de Guatemala, 2011, p. 22–32; Dirección General de Minería, 2011; Banco de Guatemala, undated d).

Minerals in the National Economy

In 2010, the value of production of mined metallic and industrial minerals (not including the manufacturing of mineral commodities, such as cement, crude steel, or petroleum refinery products) accounted for slightly greater than 1.9% of the gross domestic product (GDP) at current prices compared with greater than 1.6% of the GDP in 2009. This increase in the mining sector's share of the GDP was despite only a 0.1% increase in the real value of production by the sector in 2010 compared with a 4.2% increase in 2009. The two main markets for the mined minerals produced in Guatemala were the (mostly domestic) construction sector and the (almost entirely export) market for precious metals (gold and silver). The increase in the contribution of the mining sector to the GDP was more than matched by a decrease in the contribution of the construction sector to 4.1% of the GDP compared with 4.6% in 2009, and the real value of production by the construction sector decreased by 11.8% in 2010 following a 10.8% decrease in 2009. Hence, the increases in both the real value and volume of production by the combined mining sector appeared to be entirely owing to increases in the real value and volume of gold and silver production, and despite a probable decrease in that of minerals used primarily in the construction sector (table 1; Dirección General de Minería, 2011; Banco de Guatemala, undated c, d).

The total value of mineral production (extraction only) in Guatemala was estimated to have increased to $797 million from a revised figure of $620 million in 2009; this increase was mostly owing to an increase in the value of nonfuel mineral production to $519 million compared with $363 million in 2009. In turn, the increase in the value of production of nonfuel minerals was entirely owing to an increase in the value of production of metallic minerals (mainly gold and silver) to about $499 million from $332 million, which more than compensated for the decrease in the value of production of industrial minerals to about $20 million compared with about $31 million in 2009. In addition to gold and silver, hematite (iron ore), which was used as an additive in the manufacturing of cement, was the only metallic mineral produced, and it was valued at about $44,000 in 2009 and $12,000 in 2010 (Dirección General de Minería, 2010, 2011; International Monetary Fund, 2011; Banco de Guatemala, undated d).

According to data provided by the Banco de Guatemala for a general category of all mineral products, which appears to include trade in some manufactured products, such as cement, coke oven products, and petroleum refinery products, the mineral trade balance in 2010 was about –$1.66 billion compared with about –$1.64 billion in 2009 and –$2.1 billion in 2008. Since the closing of the main petroleum refinery in Guatemala at the end of 2002, the mineral trade balance had exhibited a considerable deficit if trade in mineral fuels and related materials is included. In 2010, Guatemala's imports of mineral fuels and lubricants were estimated to be valued at about $2.5 million compared with $2.2 billion in 2009 and $2.8 billion in 2008, and the value of the country's exports of crude petroleum during each of these years was only about $230 million, $190 million, and about $370 million, respectively. Thus, if one were to exclude trade in the mineral fuels and related materials sector, the mineral trade balance could show a surplus of about $610 million in 2010, $370 million in 2009, and $330 million in 2008 (Banco de Guatemala, 2011, p. 53–55; undated a, b).

In 2010, total Government revenue (from royalties, mining-specific taxes, and so forth) from the mining sector (excluding production of mineral fuels) increased to about $5.6 million compared with about $4 million in 2009. The number of workers employed in mineral extraction in the country (including the extraction of mineral fuels) that were accounted for as contributing to the social security system of the country was about 3,594 compared with 3,321 in 2009, but many more temporary and other employees were believed to have been working in the mineral industry who were not officially listed as paying into the social security system. In 2008 (the latest year for which data were available), foreign direct investment (FDI) in minerals extraction in Guatemala was about $160 million (Banco de Guatemala, 2011, p. 31; Dirección General de Minería, 2011).

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[1] Where necessary, nominal values have been converted from Guatemalan quetzales (Q) to U.S. dollars (US$) at an annual average exchange rate of Q8.16=US$1.00 for 2009 and Q8.06=US$1.00 for 2010. All values are nominal, at current prices, unless otherwise stated.

Government Policies and Programs

From June 2009 and through all of 2010, the Government had suspended approval of any type of mining license (for exploration or exploitation). This moratorium on the approval of mining licenses was expected to continue until Guatemala's Congress approves a new mining law. The mining law that was in effect during 2010 (law Decree No. 48–97) was approved on January 7, 1997, and enacted on July 17, 1997. On January 12, 1998, the rules and regulations for implementing the mining law were agreed upon as part of Governmental Agreement No. 8–98 and were revised on May 11, 2001, through Governmental Agreement No. 176–2001. The main hydrocarbons law that was in force in 2010 was law Decree No. 109–83, which was approved on September 15, 1983. According to the mining and hydrocarbons laws that were in effect during 2010, subsurface mineral resources were the property of the state, and contracts for private development of these resources are typically granted through production-sharing agreements between the developer and the Government (Dirección General de Minería, 2011, undated; U.S. Commercial Service, 2011, p. 60; Dirección General de Hidrocarburos, undated).

According to Anfield Nickel Corp. (of Canada), mineral exploration licenses granted under law Decree No. 48–97 were issued for 3 years (before the current moratorium) and could be extended for two additional 2-year periods after the initial licensed period. The area of licensed exploration was to be reduced by 50% for each extension of an existing exploration license, but the Government could potentially authorize a reduction in exploration area of less than 50%. Anfield Nickel also reported that a current holder of an exploration license in Guatemala is allowed to apply for an exploitation license to mine an area of less than 20 square kilometers for a maximum of 25 years, and (if granted) the exploitation license could be extended for a single additional period of another 25 years (Anfield Nickel Corp., 2011, p. 39).

Guatemala's main investment law (law Decree No. 9–98) was enacted on February 4, 1998, and applied to FDI in the mineral industry in 2010. In addition, the Dominican Republic-Central America-United States Free Trade Agreement (CAFTA–DR) was implemented in Guatemala on July 1, 2006, and the investment chapter of CAFTA–DR helped to strengthen many aspects of the existing investment legislation in the country (for investors based in the CAFTA–DR member countries) through 2010. On August 4, 2010, a new public-private partnership law (law Decree No. 16–2010) was approved, which was expected to result in a more transparent contracting process for private investors (including private foreign investors) in Guatemala (KPMG Consultores S.A., 2010, p. 17–20, 105; Agencia de Promoción de Inversiones de Guatemala, 2011, p. 10, 33; U.S. Commercial Service, 2011, p. 59–64, 73–75).

In 2010, Guatemala was still part of the San José Pact, which enabled the country to receive crude petroleum under preferential terms and pricing from Mexico and Venezuela. Venezuela was also allowed to provide additional shipments of crude petroleum to Guatemala according to the terms of the Caracas Energy Accord. In July 2008, Guatemala also became a member of the Petrocaribe Energy Cooperation Agreement (PetroCaribe), which could allow Guatemala to be able to acquire even a bit more petroleum from Venezuela, to pay only 50% of the cost of the oil up front, and to pay for the balance of the remaining cost of the oil shipments over a maximum period of 25 years with financing at a fixed interest rate of 1% per year. It was not clear whether Guatemala would significantly increase imports of crude petroleum as a result of membership in PetroCaribe because the country had had only a "mini-refinery" since 2002 (with a capacity to refine crude petroleum that appears to have been fully occupied with refining part of Guatemala's own production of crude petroleum), and it was uncertain whether PetroCaribe might also cover shipments of petroleum refinery products from Venezuela (U.S. Energy Information Administration, 2007; Mander, 2008).

Production

Data on mineral production are in table 1. From year to year, information concerning the causes of some of the large percentage changes in many of the data series was unavailable. Many of these changes may appear to be large in percentage terms but do not involve globally significant volumes of production. Although Guatemala appears to have had some historical production of mined antimony, lead, and zinc, information concerning any production of these metals in 2009 or 2010 was not available (table 1; Dirección General de Minería, 2010, 2011).

In 2010, mine output of silver increased by about 51% and that of gold increased by only about 3.6% compared with levels of production in 2009. Production by Goldcorp Inc. of Canada at the company's Marlin Mine accounted for almost all the reported production of both gold and silver in Guatemala. Although the total tonnage of ore milled at the Marlin Mine decreased by 26% in 2010 compared with that of 2009, the recovery rates increased by 26% for silver and 3% for gold (owing to improvements in the processing plant); the average grade of silver in the processed ore also increased by 62% compared with an average increase of 39% in the average grade of gold in the ore during this timeframe. The World Steel Association (WSA) reported that Guatemala's production of crude steel increased by about 22% in 2010 compared with that of 2009. This increase appeared to be caused by steady production during every month of 2010 compared with inconsistent production in 2009, including zero production of crude steel in the country during January, February, and June 2009. In 2010, iron ore production decreased by about 71% compared with that of 2009, which could have been owing to a substantial decrease in demand from the domestic construction sector. (Guatemala's production of iron ore is reportedly used only as an additive in the country's production of construction materials, and almost entirely in the domestic manufacturing of cement) (table 1; Dirección General de Minería, 2010, 2011; World Steel Association, 2010, p. 37; 2011, p. 4, 37; Goldcorp Inc., 2011, p. 53).

Information concerning the exact causes of the substantial changes in the volumes of production of most of the industrial minerals produced in Guatemala was not available; however, for some minerals and mineral materials used in the construction sector, the substantial decreases in production were most likely owing to decreased demand (as indicated by a decrease in the real value of production in the construction sector by about 11.8% compared with that of 2009). Production of petroleum refinery products at La Libertad mini-refinery near the country's main oilfields in Peten Department is included in table 1. The only commercial production (for export) from this mini-refinery was of asphalt, and production of asphalt decreased substantially during this timeframe (table 1; Departamento de Análisis Económico, 2011, p. 11, 21; Banco de Guatemala, undated c).

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities. During 2010, Goldcorp increased the capacity of its Guatemalan subsidiary to produce gold and silver at the Marlin Mine. Castle Gold Corp. of Canada began producing gold at El Sastre in 2006 and was acquired by Argonaut Gold Inc. of Canada at the end of 2009. Argonaut did not report any gold production at El Sastre in 2010. Minas de Guatemala S.A. is still listed in table 2 despite not reporting any production of antimony to DGM for 2008, 2009, or 2010 because the company held an older type of mining license that had not expired and had not reported any mine closures (table 2; Castle Gold Corp., 2009; Argonaut Gold Inc., 2010a, b; 2011, p. 5–6; Goldcorp Inc., 2011, p. 12, 53–54).

Outlook

Once revisions to the mining law are approved by the Government and the moratorium on approval of new mining licenses is lifted, many mining projects [including a few that might produce gold, lead, nickel, silver, and (or) zinc] could develop from the exploration stage(s) into production. Until the Government completes the approval process or otherwise decides to lift the moratorium, however, timelines for mining projects in Guatemala will remain subject to this political uncertainty, in addition to any market uncertainties. Goldcorp expected to increase production of both gold and silver at the Marlin Mine to record levels in 2011. Definitive information was not available concerning firm timelines for the development of other mineral exploration properties in Guatemala (Goldcorp Inc., 2011, p. 12, 95; HudBay Minerals Inc., 2011, p. 13, 28, 34–37).

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TABLE 1

GUATEMALA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010
METALS					
Antimony	--	1,000 [e]	--	--	--
Gold, mine output, Au content kilograms	5,036	7,498 [r]	7,837	8,897	9,213
Iron and steel:					
Iron ore, gross weight[3]	7,341	31,006	452	5,463	1,604
Steel, crude thousand metric tons	292	349	250	224	274
Semimanufactures do.	304	301	306	288 [r]	300
Lead:					
Run of mine, Pb content	28	165	53	--	--
Metal, secondary[e]	8,000	8,000	10,000	14,000	13,000
Silver, mine output, Ag content kilograms	49,719	88,250	99,923	129,280 [r]	194,683
Zinc, run of mine, Zn content[e, 4]	6,000	20,000	14,000	--	--
INDUSTRIAL MINERALS					
Cement, hydraulic[e] thousand metric tons	2,400	2,500	2,500	1,500	1,500
Clays:					
Bentonite	20,034 [r]	23,569 [r]	62,749 [r]	14,284 [r]	22,423
Ferruginous, including mud and shale thousand metric tons	202	142	190	219	201
Fuller's earth (attapulgite)	19	109	--	--	--
Kaolin	4,395	2,663	2,803	1,879	2,143
Unspecified	--	94,640 [r, 5]	33,620 [r, 5]	40,029 [r]	41,123
Feldspar	17,176	30,234	45,854	5,762	402
Gypsum, crude thousand metric tons	227	495	127	19	59
Jadeite	419	411	41	18	8
Lime, hydrated[e] thousand metric tons	150	150	150	150	150
Magnesium compounds (magnesite)	1,084	7,612	11,758	17,247	--
Pumice thousand cubic meters	--	220	394	395	34
Quartz	39	--	--	1,550 [6]	777 [6]
Rhyolite	236	--	--	--	--
Salt[e] thousand metric tons	60	60	60	50	50
Stone, sand and gravel:					
Stone, crude:					
Basalt thousand cubic meters	1,604	2,085	1,583	56 [r]	1,156
Of which, andesite cubic meters	--	33,690	--	--	--
Dolomite do.	909 [r, 7]	4,654 [r]	7,351 [r]	2,051 [r]	3,817 [7]
Flagstone, phyllite do.	18	60 [e]	84	86	67
Granite	1,761	2,048 [r]	3,783	1,584	336
Limestone, crude thousand metric tons	4,938	6,390 [r, 8]	4,120 [r, 8]	6,090	4,910
Of which, dimension stone do.	29 [e]	14	--	--	--
Marble, block cubic meters	19,380 [r, 9]	47,125 [r]	33,143 [r]	20,720 [r]	72,063
Marl do.	--	--	--	14,942	500
Schist, slate thousand cubic meters	582	199	160	174	149
Stone, round, unworked, including pebbles do.	69	22 [r]	-- [r]	-- [r]	--
Sand and gravel, natural:					
Building (foundation) sand do.	--	20	14	14	--
Gravel, unspecified do.	120	6	12	3	--
River sand and gravel do.	502	140	192	174	88
Sand and gravel, common do.	447	100	287	118	204
Silica sand	57,692	67,548	65,343	35,933	62,098
Stone dust cubic meters	44,307 [r]	--	36,674 [r]	9,446 [r]	2,845
Volcanic ash and sand thousand cubic meters	417	378 [r]	359 [r]	418 [r]	1,246
Talc and steatite	526	586	1,030	6,355	2,175
Tuff cubic meters	590	39,906	22,096	39,222	184,541

See footnotes at end of table.

TABLE 1—Continued
GUATEMALA: PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite		--	5	3	--	2
Natural gas, gross[e]	thousand cubic meters	490	460	430	410	360
Petroleum:						
Crude	thousand 42-gallon barrels	5,893	5,584	5,158	4,933	4,363
Refinery products:						
Asphalt	do.	272	349	210	389	300
Naphtha	42-gallon barrels	5,010 [r]	2,590 [r]	550 [r]	590 [r]	470
Kerosene	thousand 42-gallon barrels	5	7	5	8	3
Diesel	do.	137	161	144	167	153
Refinery gas	do.	29	28	20	16	16
Total	do.	448	548	380	580	473

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. do. Ditto. -- Zero.

[1] Table includes data available through October 17, 2011.

[2] In addition to the commodities listed, some additional construction materials (clays, gravel, miscellaneous rock, and sand) are produced to meet domestic needs, but available information is inadequate to make reliable estimates of output.

[3] Includes combined production of hematite and iron oxide as reported by the Dirección General de Minería, Ministerio de Energía y Minas, Guatemala. Any or all of the reported production may not be of high enough grade for metallurgical use and is used mostly as an additive in the manufacturing of cement.

[4] Source of data from 2006 through 2008: Monthly bulletin of the International Lead and Zinc Study Group. Any or all zinc production could be attributable to the reprocessing of tailings from mining operations that had been discontinued since at least the 1980s.

[5] Figures converted to metric tons from data reported in cubic meters using a conversion factor of 1.826 metric tons per cubic meter.

[6] Figures converted to metric tons from data reported in cubic meters using a conversion factor of 1.554 metric tons per cubic meter.

[7] Figures converted to cubic meters from data reported in metric tons using a conversion factor of 2.567 metric tons per cubic meter.

[8] Figures converted to metric tons from data reported in cubic meters using a conversion factor of 2.72 metric tons per cubic meter.

[9] Figures converted to cubic meters from data reported in metric tons using a conversion factor of 2.563 metric tons per cubic meter.

TABLE 2
GUATEMALA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity^e
Antimony	metric tons	Minas de Guatemala S.A. (private, 100%)	Clavito, La Florida, and Los Lirios Mines, Ixtahuacan, Huehuetenango Department	1,000
Cement		Cementos Progreso S.A. (Holcim Ltd., 20%, and other private, 80%)	San Miguel plant, Sanarate, El Progreso Department, and La Pedrera plant, Guatemala City	3,000
Gold	kilograms	Montana Exploradora de Guatemala S.A. (Goldcorp Inc., 100%)	Marlin Mine, near municipalities of San Miguel Ixtahuacan and Sipakapa, Department of San Marcos	9,500
Do.	do.	Argonaut Gold Inc., 50%, and Rocas El Tambor S.A., 50%	El Sastre Mine, near San Antonio la Paz, El Progreso Department	200
Lead, run of mine		Tenango Mining Company S.A., 100%	Caquipec Mine, Alta Verapaz Department	NA
Lime		HORCALSA S.A. (Cementos Progreso S.A., 100%)	San Miguel plant, Sanarate, El Progreso Department	180
Petroleum, crude	thousand 42-gallon barrels	Perenco plc, 100%	Rubelsanto and West Chinaja fields, Alta Verapaz Department, and Caribe, Tierra Blanca, and Xan fields, Peten Department	6,000
Silver	kilograms	Montana Exploradora de Guatemala S.A. (Goldcorp Inc., 100%)	Marlin Mine, near municipalities of San Miguel Ixtahuacan and Sipakapa, Department of San Marcos	200,000
Steel:				
Crude		Siderúrgica de Guatemala S.A. (SIDEGUA) {Corporación Aceros de Guatemala S.A. [Corporación Centroamericana del Acero S.A. (Gerdau S.A., 30%, and other private, 70%), 100%], 100%}	Electric arc furnace, near City of Escuintla, Escuintla Department	500
Semimanufactures		Indeta S.A. (INDETA) {Corporación Aceros de Guatemala S.A. [Corporación Centroamericana del Acero S.A. (Gerdau S.A., 30%, and other private, 70%), 100%], 100%}	Rolling mill at Colonia San Ignacio, Mixco, near Guatemala City	250
Do.		Industria Galvanizadora, S.A. (INGASA) (Industrias Monterrey S.A. de C.V., 100%)	Plant near Guatemala City	74
Zinc, run of mine		Tenango Mining Company S.A.	Caquipec Mine, Alta Verapaz Department, and Esperanza Mine, Huehuetenango Department	NA

^{e}Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

THE MINERAL INDUSTRIES OF THE ISLANDS OF THE CARIBBEAN

ARUBA, JAMAICA, TRINIDAD AND TOBAGO, AND OTHER ISLANDS

By Susan Wacaster

ARUBA

In 2010, Aruba, a constituent country of the Netherlands, was not a significant mineral producing country. The Aruba refinery (owned by Valero Energy Corp. of Texas), which had been a regional supplier of petroleum derivatives, was idled in 2009 but restarted operations in January 2011. The refinery had a throughput volume of about 235,000 barrels per year (bbl/yr) and accounted for about 9% of Valero Corp.'s total estimated throughput capacity. The operation was halted as demand for motor fuels had decreased during the global economic downturn of 2008–9 and profits diminished as the gross refining margin narrowed (Valero Energy Corp., 2011, p. 3).

The 2010 year-on-year real gross domestic product (GDP) of Aruba decreased by about 3.7% compared with a decrease of 10.5% in 2009 and 0.1% in 2008 after positive GDP growth rates for most years since at least 1991 that varied between 1.1% and 7.8%. The decrease in 2010 was attributable to slowed activity in the construction, manufacturing (including petroleum processing), and tourism sectors. In 2010, 56% of the total value of merchandise exported from Aruba was accounted for by petroleum sector goods (compared with 94% in 2009), and 18% of the total value of merchandise received by Aruba was accounted for by oil sector imports (compared with 9% in 2009) (Centrale Bank van Aruba, 2010, p. x, 10, 103).

In June 2010, the Government of Aruba implemented a new tax regime for Valero's Aruba refinery and terminal operations that requires the company to pay a 7% windfall profits tax but not a dividends withholding tax. All imports and exports are to be exempt from the turnover tax (a tax applied to a product at a specific stage of production) and throughput fees (a fee per volume of product moved through the terminal), but beginning in July 2012, the company was to begin paying a minimum annual tax of $10 million (Valero Energy Corp., 2011, p. 90).

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JAMAICA

In 2010, Jamaica was estimated to be the world's sixth ranked producer of bauxite behind Australia, China, Brazil, India, and Guinea. United Company RUSAL (RUSAL) of Russia was the majority owner of two alumina refineries in St. Catherine—the Alumina Partners of Jamaica (ALPART) refinery (65%) and the West Indies Alumina Co. (Windalco) refinery (93%). Both plants had been idled in 2009 because of decreased international prices and demand combined with the high cost of supplying energy to the alumina refineries. In June 2010, operations recommenced at the Windalco plant, but the ALPART plant remained closed throughout the year. The combined capacity of the two Bayer process plants was about 2.9 million metric tons (Mt) (Bray, 2011; United Company RUSAL, 2011, p. 12, 18, 34).

Minerals in the National Economy

Compared with that of 2009, the value contribution of the mining and quarrying sector to the nominal GDP of Jamaica increased in 2010 by about 41% to $8.96 billion, which accounted for just 1% of the country's GDP. The increase was attributable to the recommencement of operations at the Windalco refinery. The mining and quarrying sector had accounted for between 3% and 4% of the GDP each year from 2002 through 2008 (Statistical Institute of Jamaica, 2011a).

Production

Data on mineral production are in table 1. The production volume of Jamaica's primary mineral commodities in 2010 changed little compared with that of 2009 because both of RUSAL's refineries remained closed for the first half of 2010.

Mineral Trade

In 2010, the combined value of exports of alumina, bauxite, and gypsum accounted for about 42% of the total value of domestic exports compared with 36% in 2009. The value of mineral fuel exports accounted for about 23% of the total export value. Of the total value of imports received by Jamaica in 2010, mineral fuels accounted for about 30% compared with 28% in 2009 (Statistical Institute of Jamaica, 2011a–c).

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TRINIDAD AND TOBAGO

In 2010, the Republic of Trinidad and Tobago was a crude oil and natural gas producer, and its economy was dependent upon the hydrocarbon sector. The country's energy sector experienced moderate growth whereas nonenergy sector growth continued to decrease but at a slower rate than in 2009. The increased performance in the energy sector was primarily attributed to increased output of natural gas and petrochemicals. Crude oil production, however, decreased (Central Bank of Trinidad and Tobago, 2011a, p. 6).

Minerals in the National Economy

According to the Central Bank of Trinidad and Tobago, the country's year-on-year real GDP was estimated to have increased by 0.1% compared with a decrease of 3.5% in 2009. The real value added in the energy sector's share of the GDP increased by 3.0% whereas that of the nonenergy sector decreased by 1.9%. As a percentage of the GDP, exports accounted for 50.3% of the country's balance of payments. The value contributed to the balance of payments from exports was about $7.7 billion, of which about $6.4 billion, or 84%, was from the export of energy products (Central Bank of Trinidad and Tobago, 2011a, p. 12).

Production

In 2010, production of crude oil decreased by about 18% compared with that of 2009. The decrease was attributable in part to maintenance shutdowns at BHP Billiton Ltd. of Australia's offshore petroleum production facilities during the last quarter of 2010. Refinery output decreased by about 13% because of flooding at a power station that supplied electricity to the Point á Pierre refinery (which was owned by Petroleum Company of Trinidad and Tobago Ltd.). The flooding resulted in a shutdown of the refinery and a 19.7% decrease in refinery throughput from July to November compared with that of the same time period in 2009. Production of natural gas liquids increased by about 20% in 2010 compared with that of 2009. The increase was attributed, in part, to a 6.3% increase in production from July to November at Phoenix Park Gas Processors Ltd. of Port of Spain compared with the same period in 2009. Production of cement decreased by 10%, which was attributable to a decrease in construction sector activity during the year. (The construction sector's share of the GDP in 2010 decreased by an estimated 9%.) Domestic sales of cement were estimated to have decreased by about 23%. Data on mineral production are in table 1 (Central Bank of Trinidad and Tobago, 2011b, p. 13–14).

Mineral Trade

In 2010, exports of refinery products decreased by about 26% to 35 million barrels (Mbbl) compared with those of 2009, and exports of crude oil decreased by about 6% to 17 Mbbl. About 17 Mbbl of exported natural gas liquids was produced by Phoenix Park Gas Processors Ltd. About 6 Mt of methanol (which was about 1% greater than the volume that was produced), 5.3 Mt of ammonia, and 676,000 metric tons (t) of urea were exported in 2010. The volume of direct-reduced iron (DRI) exported during the first three quarters of 2010 was estimated to have doubled compared with that of the same period in 2009 (Central Bank of Trinidad and Tobago, 2011a, p. 17; Ministry of Energy and Energy Affairs, 2011, p. 16–17, 19–20).

Commodity Review

Metals

Iron and Steel.—Activity in the iron and steel sector of Trinidad and Tobago was strongly affected by the economic downturn of 2008 and 2009 but began to recover in 2010 as regional and global demand for iron and steel products increased. During the first three quarters of 2010, production of DRI increased by 74.8% compared with that of the same period in 2009, but for the entire year of 2010, production of DRI increased by 48% to about 1.7 Mt compared with that of 2009. Crude steel production increased by 37% in 2010 to about 572,000 t, and billet production decreased by about 13% to 361,000 t. The overall increased production of iron and steel contributed to the increased natural gas pipeline utilization rates (the measure of flow per design capacity of the pipeline) as the fuel was consumed at iron and steel plants (Central Bank of Trinidad and Tobago, 2011a, p. 17).

Mineral Fuels

Petroleum.—Production of crude oil continued to decrease in 2010 as operators tried to maintain production rates from the country's mature oilfields and BHP Billiton proceeded with infrastructure improvements in late 2010 and into 2011. Production from January through November decreased by 7.3% compared with the same period in 2009 and was less than 100,000 barrels per day for the first time in decades, which resulted in a decrease in exports for the same period (Central Bank of Trinidad and Tobago, 2011c, p. 4, 16, 17).

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OTHER ISLANDS OF THE CARIBBEAN

The Netherlands Antilles, which had been composed of Bonaire, Curacao, Saba, Sint Eustatius, and Sint Maarten, was dissolved on October 1, 2010. Curacao and Sint Maarten became autonomous territories of the Kingdom of the Netherlands. Bonaire, Saba, and Sint Eustatius were henceforth to be directly under the administration of the Kingdom of the Netherlands. The Organization of Eastern Caribbean States (OECS) was composed of Anguilla, Antigua and Barbuda, British Virgin Islands, Dominica, Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, and Saint Vincent and the Grenadines. The economies of the other islands of the Caribbean did not depend upon domestic mineral production for purposes of trade or economic growth, and mineral production data were unavailable (U.S. Department of State, 2011).

In 2009 (the most recent year for which data were available), the percentage of real GDP that was accounted for by the mining and quarrying sectors of the OECS countries ranged from a minimum of 0.2% in St. Kitts and Nevis to a maximum of 2.7% in Antigua and Barbuda. During the period from 2000 through 2009, the percentage share in the GDP of the mining and quarrying sector in most countries varied little or not at all (usually only between about 0.1% and 0.2% in a given year) with the exception of Anguilla, Antigua and Barbuda, and Montserrat where the sector's share of the GDP began to increase in the early- to mid-2000s to between about 1% and 3%. Most of the sector's output in all countries was accounted for by quarry production for local use, such as for roads and construction materials. Significant increases in output in some countries may have been owing to increases in tourism industry construction projects (Organization of Eastern Caribbean States, 2011).

According to the OECS, the value added in mining and quarrying decreased by 30.0% in Anguilla to $6.2 million and in Saint Kitts and Nevis to $1.4 million compared with that of 2009; by 29.0% in Grenada to $5.3 million; by 15.0% in Antigua and Barbuda to $46.1 million; by 11.1% in Saint Lucia to $6.1 million; by 8.4% in Saint Vincent and the Grenadines to $2.2 million; and by 8.3% in Dominica to $4.2 million. The value increased by 8.3% in Montserrat to $1.7 million. Data were not available for the British Virgin Islands. Large year-on-year percentage changes are not necessarily attributable to large increases or decreases in production because the total dollar values derived from mining and quarrying activity was relatively small (Organization of Eastern Caribbean States, 2011).

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TABLE 1

ISLANDS OF THE CARIBBEAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity[3]		2006	2007	2008	2009	2010[e]
ARUBA						
Petroleum, refinery products	thousand 42-gallon barrels	62,000	67,400	56,700	35,767	--
Sulfur, byproduct of petroleum		50,000	97,657	81,269	65,000	--
BAHAMAS, THE						
Salt		1,151,547	882,300	1,024,400	1,000,000	1,000,000
Stone, argonite		1,100	1,100	1,100	1,100	1,100
BARBADOS						
Cement:						
Hydraulic		337,801	316,467	301,427	300,000	300,000
Clinker		290,000	290,000	290,000	290,000	290,000
Clay and shale		145,000	145,000	145,000	145,000	145,000
Limestone		1,900,000	1,900,000	1,900,000	1,900,000	1,900,000
Natural gas:						
Gross	million cubic meters	23	21	15	16	16
Marketed	do.	12	12	12	12	12
Petroleum, crude	thousand 42-gallon barrels	343	293	290	300	300
Sand[e]		500,000	500,000	500,000	500,000	500,000
GUADELOUPE[e]						
Cement		230,000	230,000	230,000	230,000	230,000
Limestone		5,000	5,000	5,000	5,000	5,000
Pumice		210,000	210,000	210,000	210,000	210,000
Salt		49,000	49,000	49,000	49,000	49,000

See footnotes at end of table.

TABLE 1—Continued

ISLANDS OF THE CARIBBEAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity[3]		2006	2007	2008	2009[e]	2010[e]
JAMAICA						
Bauxite and alumina:						
Bauxite, dry equivalent, gross weight	thousand metric tons	14,851 [r]	14,588 [r]	14,697 [r]	7,817 [r]	8,540
Alumina	do.	4,100	3,941	3,996	1,774 [r]	1,591 [4]
Cement, hydraulic		762,912 [r]	773,570 [r]	742,529 [r]	742,208	740,000
Clay		11,687	663,844	101,198	NA	NA
Gypsum		364,432	227,697	238,274	230,000	230,000
Lime		303,795	276,800	312,669	300,000	300,000
Petroleum refinery products:						
Fuel oil	thousand 42-gallon barrels	165,163	179,868	175,000	175,000	175,000
Gasoline	do.	47,217	45,007	45,000	45,000	45,000
Jet fuel	do.	21,599	17,819	17,000	17,000	17,000
Diesel oil	do.	68,004	62,562	62,000	62,000	62,000
Pozzolan		149,279	114,482	124,304	124,000	124,000
Salt[e]		19,000	19,000	19,000	19,000	19,000
Sand and gravel		2,760	3,611	2,985	3,000	3,000
Shale, for cement		180,036	168,354	200,301	175,000	175,000
Silica sand		9,567	14,460	14,818	14,000	14,000
Stone:						
Limestone	thousand metric tons	2,801	2,950	2,527	2,200	2,200
Marble, cut and (or) polished[e]		120	120	120	NA	NA
Marl and fill	thousand metric tons	3,001	3,228	2,740 [r]	2,500	2,500
MARTINIQUE[e]						
Cement, hydraulic		221,000	221,000	221,000	221,000	221,000
Lime		5,000	5,000	5,000	5,000	5,000
Petroleum refinery products	thousand 42-gallon barrels	4,800	4,800	4,800	4,800	4,800
Pumice		130,000	130,000	130,000	130,000	130,000
Salt		200,000	200,000	200,000	200,000	200,000
SAINT KITTS AND NEVIS[e]						
Sand and gravel		223,000	223,000	223,000	223,000	223,000
Stone, crushed		131,000	131,000	131,000	131,000	131,000
TRINIDAD AND TOBAGO						
Asphalt, natural[e]		16,200	16,200	16,200	16,200 [4]	16,200
Cement, hydraulic		883,000	901,000 [r, 4]	957,700 [r, 4]	870,000 [r, 4]	784,000
Iron and steel:						
Direct-reduced iron		2,071,500	2,063,800	1,601,000 [r]	1,182,000 [r]	1,752,000 [4]
Steel, crude		674,000	682,000	489,000	417,000 [r]	572,000
Semimanufactures, billets		673,000	694,600	489,600 [r]	417,000 [r]	361,000
Natural gas, gross:[5]	million cubic meters	40,082	41,766	40,000	42,903	44,565 [4]
Natural gas liquids	thousand 42-gallon barrels	11,251	12,500	12,500	14,400	17,222 [4]
Nitrogen, N content of anhydrous ammonia		5,110,500	5,129,300	5,100,000	4,945,900	5,553,242 [4]
Petroleum:						
Crude	thousand 42-gallon barrels	52,105	43,600	43,799	40,821	33,665 [4]
Refinery products	do.	57,585	56,100	50,800	53,300	46,167 [4]
Urea		688,300	709,637 [4]	700,000	700,000	708,760 [4]

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. NA Not available.

[1] Table includes data available through November 1, 2011.

[2] Netherlands Antilles was dissolved in 2010.

[3] In addition to the commodities listed, Trinidad and Tobago also produces limestone, secondary refined lead, and sulfur (byproduct of petroleum).

[4] Reported figure.

[5] Marketed natural gas is no longer reported.

TABLE 2
ISLANDS OF THE CARIBBEAN: STRUCTURE OF THE MINERAL INDUSTRIES IN 2010

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
ARUBA[1]			
Petroleum, refinery 42-gallon barrels per day	Valero Energy Corp.	Southern Aruba	235,000
BAHAMAS, THE			
Petroleum, refinery thousand 42-gallon barrels	Bahamas Oil Refining Company International Ltd. (BORCO) (First Reserve Corp., 80%)	Storage facilities, Freeport	20,000
BARBADOS			
Cement	Arawak Cement Company Ltd. (Trinidad Cement Ltd.)	Checker Hall, Saint Lucy	300,000
CURACAO[2]			
Petroleum, refinery 42-gallon barrels per day	Isla Oil Refinery (Petroleos de Venezuela S.A., 100%)	Willemstad	320,000
Do. do.	Refinería Dominicana de Petróleo S.A. (Government, 50%, and Shell International Petroleum Company Ltd., 50%)	Haina Port	34,000
JAMAICA			
Alumina	Alumina Partners of Jamaica (ALPART) (United Company RUSAL, 65%, and Hydro Aluminium Jamaica, 35%)	Refinery, Nain, St. Elizabeth	1,650,000
Do.	West Indies Alumina Co. (WINDALCO) (United Company RUSAL, 93%, and Government, 7%)	Ewarton Works refinery, Saint Catherine	650,000
Do.	do.	Kirkvine Works refinery, Manchester	600,000
Do.	Jamaica Aluminum Co. (Jamalco) (Alcoa World Alumina and Chemicals, 55%, and Government, 45%)	Refinery at Halse Hall, Clarendon, 70 kilometers west of Kingston	1,480,000
Bauxite	St. Ann Bauxite Company Ltd. (Noranda Aluminum Holding Corp., 49%, and Government., 51%)	Bauxite mine, Discovery Bay	4,500,000
Do.	Jamaica Aluminum Co. (Jamalco) (Alcoa World Alumina and Chemicals, 55%, and Government, 45%)	Bauxite mine, Manchester	3,700,000
Do.	West Indies Alumina Co. (WINDALCO) (United Company RUSAL, 93%, and Government, 7%)	Bauxite mine in Schwallenburgh, Ewarton	2,300,000
Do.	do.	Bauxite mine, Russell Place	2,000,000
Do.	Alumina Partners of Jamaica (ALPART) (United Company RUSAL, 65%, and Hydro Aluminium Jamaica, 35%)	Bauxite mine, Nain, St. Elizabeth	5,000,000
Petroleum, refinery 42-gallon barrels per day	Petrojam Ltd. (Government, 100%)	Kingston Port	36,000
TRINIDAD AND TOBAGO			
Ammonia	Tringen I (Government, 51%, and Norsk Hydro ASA through Hydro Agri Trinidad Ltd., 49%)	Point Lisas Industrial Estate	500,000
Do.	Tringen II (Government, 51%, and Norsk Hydro ASA through Hydro Agri Trinidad Ltd., 49%)	do.	454,000
Do.	YARA Trinidad Ltd. (Government, 51%, and Norsk Hydro ASA through Hydro Agri Trinidad Ltd., 49%)	do.	227,000
Do.	PCS Nitrogen (Trinidad) Ltd. (Potash Corporation of Saskatchewan, Inc., 100%), of which:	do.	1,758,000
	Plant 1		(454,000)
	Plant 2		(454,000)
	Plant 3		(250,000)
	Plant 4		(600,000)
Do.	Caribbean Nitrogen Company I (a consortium of Clico Energy Company Ltd., Ferrostaal AG, Duke Energy Corp., BOG Resources Inc., and Kellogg, Brown, and Root)	do.	660,000

See footnotes at end of table.

TABLE 2—Continued

ISLANDS OF THE CARIBBEAN: STRUCTURE OF THE MINERAL INDUSTRIES IN 2010

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
TRINIDAD AND TOBAGO—Continued				
Ammonia—Continued		Caribbean Nitrogen Company II (a consortium of Clico Energy Company Ltd., Ferrostaal AG, Duke Energy Corp., BOG Resources Inc., and Kellogg, Brown, and Root)	Point Lisas Industrial Estate	660,000
Do.		Point Lisas Nitrogen Ltd. (formerly Farmland Misschem) (Mississippi Chemicals, 50%, and KOCH Minerals Services LLC, 50%)	do.	600,000
Iron and steel		Mittal Steel Point Lisas Ltd. (formerly Caribbean Ispat Ltd.) (Mittal Steel Group), of which:	Point Lisas, Couvas	2,200,000
		Direct-reduced iron pellets		(900,000)
		Billets		(700,000)
		Wire rods		(600,000)
Liquefied natural gas		Atlantic LNG Company of Trinidad and Tobago Train 1 (BP Trinidad and Tobago LLC, 34%; British Gas Trinidad and Tobago Ltd., 26%; Repsol YPF, S.A., 20%; Tractobel Trinidad LNG Corp, 10%; National Gas Company of Trinidad and Tobago, 10%)	Point Fortin	NA
Do.		Trains 2 and 3 (BP Trinidad and Tobago LLC, 42.5%; British Gas Trinidad Ltd., 32.5%; Repsol YPF, S.A., 25%)	do.	NA
Do.		Train 4 (BP Trinidad and Tobago LLC, 37.7%; British Gas Trinidad and Tobago Ltd., 28.89%; Repsol YPF, S.A., 22.22%; National Gas Company of Trinidad and Tobago, 11.11%)	do.	NA
Methanol		Trinidad and Tobago Methanol Company I (CIL Financial, Ferrostaal AG, Helm AG, GE Capital Group)	do.	500,000
Do.		Trinidad and Tobago Methanol Company II (Trinidad and Tobago Methanol Co., 100%)	do.	500,000
Do.		Caribbean Methanol Company Ltd. (two plants) (Clico Energy Company Ltd., a subsidiary of a local insurance conglomerate, Ferrostaal AG, and Methanex Corp.)	do.	1,050,000
Do.		Atlas plant (Methanex Corp., 100%)	do.	NA
Do.		New Methanol Holdings M5 Plant	do.	NA
Natural gas liquids	42-gallon barrels per day	Phoenix Park Gas Processors Ltd. (National Gas Company of Trinidad and Tobago, 51%)	Port of Spain	33,500
Petroleum:				
Refinery	do.	Petroleum Company of Trinidad and Tobago Ltd. (Petrotin) (Government, 100%)	Pointe-a-Pierre	175,000
Crude	do.	BHP Billiton Ltd.	Angosture oilfield	4,745,000
Urea		PCS Nitrogen Trinidad Ltd. (Potash Corporation of Saskatchewan, Inc., 100%)	do.	530,000

Do., do. Ditto. NA Not available.

[1] A semiautonomous part of the Netherlands.

[2] When the Netherlands Antilles dissolved on October 10, 2010, Curacao became a semiautonomous part of the Netherlands.

THE MINERAL INDUSTRY OF MEXICO

By Alberto Alexander Perez

Mexico's economy, in terms of the gross domestic product (GDP), was the second largest in Latin America after that of Brazil. The GDP of Mexico in 2010 was $1.596 trillion, which was a 5.4% increase from that of 2009. Mexico's inflation rate was 4.2%, and the official unemployment rate was 5.4%, although underemployment, as reported by the U.S. Central Intelligence Agency, may have been as high as 25% (U.S. Central Intelligence Agency, 2011).

The mineral industry was among the most profitable economic sectors of the country and represented a major source of revenue for the Government. The continued world economic recovery and the subsequent increase in mineral demand led to a 40.2% increase in the value of mining production in 2010 compared with that of 2009. This change represented an increase of 14.3% in the mineral industry's contribution to Mexico's GDP. Employment in the mineral industry increased by 5.3% as a result of the creation of about 14,299 new jobs in the industry.

The leading mineral-rich areas where copper, gold, silver, and zinc (although not exclusively) were produced, are located in the north and the west-central parts of the country. The main oil-producing areas are located in the east and south (Cámara Minera de México, 2011, p. 6; U.S. Central Intelligence Agency, 2011).

Mexico was a leading world producer of several mineral commodities. In 2010, the country was the world's leading producer of silver, the second ranked producer of fluorspar, and the third ranked producer of bismuth, celestite, and sodium sulfate. Mexico also was the 4th ranked producer of wollastonite; the 5th ranked producer of diatomite, lead, and molybdenum; the 6th ranked producer of cadmium; the 7th ranked producer of barite, graphite, and salt; the 8th ranked producer of manganese and zinc; the 11th ranked producer of feldspar, gold, and sulfur; the 12th ranked producer of copper ore, and the 14th ranked producer of iron ore and phosphate rock (Brooks, 2011a, b; Cámara Minera de México, 2011, p. 73; Carlin, 2011; Corathers, 2011; Guberman, 2011; Kostick, 2011; Miller, 2011; Polyak, 2011; Tolcin, 2011a, b).

Minerals in the National Economy

The mineral industry was the third main source of foreign currency for the country after crude oil exports and remittances by Mexicans living abroad; the other main source was tourism. Crude oil production had consistently decreased for several years, although in 2008, Mexico's crude oil exports achieved their highest value owing to the increase in the price of crude oil in international markets. The mineral industry was a critical sector within the Mexican economy (Cámara Minera de México, 2011, p. 7–8).

Of the total mineral industry production in Mexico in 2010, gold accounted for a 25.4% share followed by silver (20.3%), copper (15.9%), zinc (9.9%), iron (5%), coke (4.9%), coal (4%), molybdenum (3.3%), lead (3%), and other minerals (8.7%) (Cámara Minera de México, 2011, p. 8). In terms of value, the State of Sonora produced almost 22.97% of Mexico's total nonfuel mineral production in 2010. The State of Zacatecas produced 22.94%; Chihuahua, 14.05%, and Coahuila, 11.30%. The States of Durango and San Luis Potosi also contributed significantly to the value of nonfuel mineral production (Secretaría de Economía, 2011, p. 60–92).

Government Policies and Programs

Natural resources, and minerals in particular are considered part of the national patrimony of Mexico under its Constitution. Article 27 deals with issues of ownership and exploitation of natural resources; however, the mining law that became effective in 1992 and was subsequently modified and expanded in 1996 and again in April 2005, clarifies and spells out the legal framework for the exploration, production, and processing of the country's mineral resources. The law allows a 100% private equity ownership stake in the exploration, production, and development of mineral resources, including resources previously reserved for direct Government exploitation, such as coal, iron, phosphorus, potassium, and sulfur. Oil and its derivatives, as well as radioactive materials, are not covered in this law. Exploration concessions are granted for 6 years and are not renewable. Production concessions are awarded for 50 years and are renewable for an additional 50 years (Cámara de Diputados del H. Congreso de la Unión, 2006, p. 1–33).

The mining law was revised to decrease the administrative procedures and establish time limits for most of these procedures. The public service manual of mining related issues, which was published in July1999 and is still current, spells out the established regulations and administrative procedures for all mining matters (Secretaría de Economía, 1999).

The mining sector is administered by the Secretaría de Economía, and the Direccion General de Minas is the organization in charge of making revisions to the mining law and its regulations, as well as granting concessions and titles.

Another important law concerning all Mexican resources is the Law of Foreign Investment, which regulates the degree and form of foreign investment in Mexico, and, in particular, in the natural resources sector—an area that was previously barred from foreign investment and ownership. This law was published in 1993 and has since been revised and amended by decrees in 1995, 1996, 1998, 1999, and, most recently, in 2000. In particular, Articles 10 through 14 deal with foreign investment in the mining sector and the development and exploitation of geographic areas considered restricted by the Government (Cámara de Diputados del H. Congreso de la Unión. 2012).

The General Law of Ecological Balance and Environmental Protection (LGEEPA), which is the keystone of environmental legislation, was passed in 1988. Those environmental responsibilities that had resided in various Government agencies were transferred to the Secretaria de Medio Ambiente, Recursos Naturales y Pesca (SEMARNAP) in 1994. In 2000, the agency became the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). Under SEMARNAT, mineral exploration and mining require a number of environmental permits and authorizations to conform to the provisions of the LGEEPA. These requirements include a preliminary environmental impact statement for all major activities of the projects. The SEMARNAT also requires all mines and plants to have an operating license, as well as permits for explosives, hazardous materials handling, land use, water discharge, and well usage. Other regulations are concerned with dumps and tailings, electrical transformers, gas and dust emissions, noise, and the storage of oil and fuel.

The regulation of environmental impact statements was initiated in 2000. Under the new rules, environmental impact reports for beneficiation plants, gas and oil pipelines, and mines must be approved by the SEMARNAT. According to this agency, the level of sites considered contaminated with dangerous byproducts, including from mining and manufacturing, remained stable since 2006 at 330 registered sites; however, this was an increase from 297 registered sites in the period from 2000 through 2004. In their index of the physical volume of production of dangerous residuals produced by the mining sector, the SERMANAT estimated that, since 2000, the level of dangerous residuals (measured in terms of the total value of production) had increased by 8%. In total volume of production, this was still lower than that produced by the manufacturing sector; however, the rate of growth of dangerous residuals produced by the manufacturing sector was lower at about 5% of the total value of production (Secretaría de Medio Ambiente y Recursos Naturales, 2008).

Production

Mexico's mineral production levels in 2010 recovered from the general decrease in the levels of production of 2009. The production increases were led by ferromanganese (production of which increased by 92.9%) followed by marble and silicomanganese (58% each), fuller's earth (57.5%), kaolin (54%), dolomite (53%), refined gold (49.4%), lead (33.5%) graphite (29.8%), silver (24%) iron ore (19.9%), crude steel (19.7%), and zinc (16.4%), among others (table 1). Mineral commodities for which production decreased during the year included talc (production of which decreased by 97.4%), vermiculite (66.3%), gypsum and perlite (38% each), strontium (13%), and common clays (9.2%) (table 1; Secretaría de Economía, 2011, p. 218–542).

In 2010, crude oil production by Petróleos Mexicanos S.A. de C.V. (PEMEX), which was the state-owned oil monopoly, decreased slightly (by less than 1%) to about 940 million barrels in 2010. Gross natural gas production also decreased slightly, to 72,615 million cubic meters (table 1; Petróleos Mexicanos S.A. de C.V., 2011, p. 4).

Structure of the Mineral Industry

A few large domestic companies produced a significant portion of Mexico's mineral output, including Cementos Mexicanos, S.A.B. de C.V. (CEMEX), Empresas Frisco S.A. de C.V. (Frisco), Fresnillo plc., Grupo Acerero del Norte, S.A. de C.V. (GAN), Grupo México, S.A.B. de C.V. (Grupo México), Industrias Peñoles S.A.B. de C.V., and Cía. Minera Autlan, S.A. de C.V., whereas medium- and small-size companies produced many of the industrial minerals. State-owned PEMEX controlled the crude petroleum, petroleum refining, and natural gas production sector (table 2).

The Secretaría de Economía reported that, in 2010, a total of 286 foreign mining companies had direct foreign investments in Mexico in 757 projects. Of these companies, 210 had their central offices in Canada and 44 were headquartered in the United States; 8, in Australia; 6, in the United Kingdom; 4, in Japan; 3, in China; 2 each, in Korea, India and Peru; and 1 each in Belgium, Chile, Italy, Luxembourg, and the Netherlands. Precious metals, particularly gold and silver, were the primary targets for 452 of these projects. Polymetallic projects accounted for 133 of the projects; 95 were projects involving copper; 24 were iron projects; and the rest involved a variety of minerals. The State of Sonora produced 22.97% of the total value of mineral output in 2010; Zacatecas, 22.94%; Chihuahua, 14.02%; Coahuila, 11.30%; and the rest was produced in other States (Secretaría de Economía, 2011, p. 564–567).

Mineral Trade

In 2010, Mexico was a net exporter of nonfuel minerals, in terms of value, registering a trade surplus of $5.98 billion. This surplus was mostly because the country was a net precious minerals exporter in 2010, as it had been for the past several years, and its precious metals exports increased by 53.7% compared with those of 2009. The value of Mexico's total mineral production in 2010, excluding mineral fuels, was $13.900 billion, of which 92% was metallic minerals and 8% was nonmetallic minerals (Cámara de Mineria de México, 2011, p. 7–8).

Mexico's principal export partners were the United States and Canada (which were fellow members of the North America Free Trade Agreement) and also, in order of the value of trade, Spain, Japan, Germany, Colombia, and China. Mexico's principal import partners were the United States and China; other significant sources of imports were, in order of amount of trade, Japan, the Republic of Korea, Germany, Canada, and Brazil (U.N. Comtrade, 2012).

The role of China in the mineral production of Mexico was mostly as a consumer; China had only three large investments in the Mexican mineral industry. China's influence as a destination for Mexican mineral exports, however, was considerable.

Commodity Review

Metals

Copper.—Grupo México announced that its el Arco project in the State of Baja California was on schedule and that once production begins, the project would produce 190,000 metric tons per year (t/yr) in concentrates and cathodes of copper, and would also produce gold and molybdenum. Mexican copper production, in terms of volume, increased by 12% compared with that of 2009, and, in terms of value, by 44%.

In 2010, 94.5% of all copper production took place in the following four states: Sonora (66.7%), Zacatecas (14.9%), San Luis Potosi (8%), and Chihuahua (4.9%). The Cananea Mine, which is located in the State of Sonora, restarted production in June and was renamed Buenavista del Cobre S.A. de C.V. The owner, Grupo México, announced that the mine would be producing at 100% capacity by April 2011. La Caridad copper mine (also referred to as Nacozari), which was operated by Mexicana de Cobre S.A. de C.V. (as subsidiary of Grupo México) and was the main copper producing site in Mexico, produced 117,734 t of copper. Industrias Peñoles produced 21,768 t at its Milpillas Mine; Negociacion Minera Santa Maria de la Paz y Anexas S.A. (NEMISA) produced 18,000 t in concentrates at its Santa Maria de La Paz unit in the State of San Luis Potosi; and Capstone Mining Corp. of Canada produced 16,117 t at its Cozamin Mine in the State of Zacatecas. Empresas Frisco S.A. de C.V. produced 8,826 t at its Maria Mine, which is located in the State of Sonora and 5,718 t at its Tayahua Mine, which is located in the State of Zacatecas (Cámara Minera de México, 2011, p. 17–18).

Gold.—In 2010, the value of gold production in Mexico surpassed the value of silver production as it had in 2009, and reached 25.4% of the total value of the mineral industry in Mexico. Mexico's gold mine output, in terms of gold content, was 72,596 kg, which was an increase of 41% compared with production in 2009, and the highest level of production ever for the country (table 1; Cámara Minera de México, 2011, p. 8, 12).

In 2008, Goldcorp Inc. of Canada became the leading producer of gold in Mexico. In 2010, the output from the company's mines accounted for 29% of Mexico's production. Goldcorp owned the Los Filos gold mine in the State of Guerrero, which produced 9.52 t of gold in 2010. It also owned the El Sauzal Mine in the State of Chihuahua, which produced 4.72 t (a decrease of 25.5% compared with that of 2009) and the San Dimas Mine in the State of Durango, which produced 1.66 t. Goldcorp sold the San Dimas Mine to Primero Mining Corp. of Canada in August. Goldcorp also owned the Peñasquito Mine in the State of Zacatecas, which increased production by 186% to 5.23 t. According to Goldcorp, although the Peñasquito Mine had started operations in May 2008, it did not reach full commercial production until February 2010. Goldcorp expected that the mine would begin producing at its full capacity of 10.88 t/yr by 2011. If this is the case, the Peñasquito Mine would be the largest gold mine, in terms of gold content production, in Mexico.

Fresnillo produced 5.06 t of gold at its La Herradura Mine in the State of Sonora and 3.52 t at its La Cienega Mine in the State of Durango. Gammon Gold Inc. produced 3.2 t of gold at its Ocampo Mine in the State of Chihuahua, and Alamos Gold Inc. of Canada produced 4.8 t at its Mulatos Mine in the State of Sonora. The Cerro San Pedro Mine in San Luis Potosi, which was owned by Minera San Xavier S.A. (a subsidiary of the Canadian company New Gold Inc.) produced 3.7 t of gold. For the year (its first full production year in Mexico), Coeur D'Alene Mines Corp. of the United States reported that its Palmarejo Mine, which is located in the State of Chihuahua, produced 3.1 t (Cámara Minera de México, 2011, p. 13–14).

Iron Ore and Iron and Steel.—According to the Cámara Minera de México (CAMIMEX), Mexico does not have significant iron ore reserves; however, its production and reserves are sufficient to meet national demand (Cámara Minera de México, 2011, p. 22). In 2010, Mexico produced 14 million metric tons (Mt) of iron ore, which is 20% more than in 2009. Production was from the States of Colima, Durango, and Michoacan.

Iron ore exports to China increased by more than 1 Mt in 2010 compared with those of 2009; this trade was mostly done by private traders and mineral commodity consolidators, and most of the ore was shipped through the Port of Lazaro Cardenas in Michoacan and the Port of Manzanillo in Colima. The Federal Government expressed concern about possible illegal exports of the ore, and according to CAMIMEX, the Secretaría de Economía was taking steps to curb illegal trade, although what those steps were was not made clear (Cámara Minera de México, 2011, p. 22).

Crude steel production increased by 19.7% and pig iron production increased by 16.7% compared with production in 2009. Mexico was the 13th ranked producer of steel, by volume, in the world in 2010 with a production of 16.7 Mt. Altos Hornos de Mexico S.A. (AHMSA), ArcelorMittal of Luxembourg, DeAcero S.A. de C.V., and Ternium S.A. were the principal steel producers in the country and together accounted for 79.5% of Mexico's total crude steel production (table 1; Cámara Minera de México, 2011, p. 24; World Steel Association, 2011).

Lead.—In 2010, the output of lead mine production in Mexico increased by 33.5%, and primary metal production increased by 30%. According CAMIMEX, the total value of lead production in 2010 amounted to 78% more than in 2009. Mexico produced 4% of the world's total output of lead in 2010 (table 1; Cámara Minera de México, 2011, p. 19).

Goldcorp's Peñasquito Mine, was the leading lead mine in Mexico in terms of lead content production. In 2010, Peñasquito produced 43,904 t of lead.

Industria Peñoles continued to be a major producer of lead in Mexico with an output of 43,080 t in 2010 among all of its properties, which included the Naica Mine located in the State of Chihuahua. The Santa Barbara Mine, which was also located in Chihuahua and was owned by Grupo México, produced 13.73 t of lead in 2010 (table 1; Cámara Minera de México, 2011, p. 19–20).

Molybdenum.—Molybdenum production in the country increased in volume by 6.7% to a record of 10,849 t in 2010. In terms of value, the increase was 43% compared with that of 2009 owing to the increase in the volume of production and the increase in international prices. Molybdenum accounted for 3.3% of the total value of mineral production in Mexico in 2010 and was Mexico's eighth most valuable mineral commodity.

Grupo México owned La Caridad Mine in the State of Sonora, which produced 98% of all molybdenum in the country. Most of La Caridad Mine's output was processed into molybdenum trioxide at the facilities in Cumpas, State of Sonora, mostly for export (table 1; Cámara Minera de México, 2011, p. 8, 20–21).

Silver.—Mexico was the leading silver producer in the world in 2010, accounting for 17.5% of world silver production. Mexico's silver mine output was 4,411 t, which was a historic high for the country and represented an increase in production of 24% compared with that of 2009 (table 1).

The Fresnillo Mine, which is located in the State of Zacatecas, remained the richest silver mine in the world, producing 1,117 t in 2010 (an increase of 1.4% compared with that of 2009) and accounted for 28% of all silver produced in the country (Cámara Minera de México, 2011, p. 11). Goldcorp's Peñasquito Mine produced 434 t of silver, and was the second ranked producer of silver, in terms of the volume of output, in Mexico after Fresnillo.

The Canadian company Pan American Silver Corp. owned the Alamo Dorado Mine, which is located in the State of Sonora, and La Colorada Mine, which is located in the State of Zacatecas. Alamo Dorado began operations in 2007 and produced 208.4 t in 2010; La Colorada produced 111.9 t. The Canadian firm First Majestic Silver Corp. was also a significant silver producer in Mexico. The company's mines (La Encantada in the State of Coahuila, La Parrila in the State of Durango, and San Martin in the State of Jalisco) produced a combined 203 t in 2010 (Cámara Minera de México, 2011, p. 15).

Zinc.—Production of zinc metal in Mexico increased by 3% in 2010 compared with that of 2009, and the level of zinc mine output increased by 16%. The total value of zinc production increased by 65% compared with that of 2009 (Cámara Minera de México, 2011, p. 19; Secretaría de Economía, 2012, p. 4).

Goldcorp's Peñasquito Mine produced 65,300 t of zinc in 2010 and became the leading zinc mine in Mexico. The Charcas Mine in the State of San Luis Potosi, which was owned by Minera Mexico S.A. de C.V., became the second ranked producer of zinc in the country, producing 57,808 t in 2010. Industrias Peñoles' Bismarck Mine in Chihuahua and Francisco I. Madero Mine in Zacatecas produced 48,400 t and 42,600 t, respectively, which made them the third and fourth ranked zinc-producing mines in the country, respectively (Cámara Minera de México, 2011 p. 19).

Industrial Minerals

Mexico was among the world's top ten producers of industrial minerals. The value of the country's production of industrial minerals in 2010 was about $730 million (table 1; Secretaría de Economía, 2012, p. 2).

Based on the value of production, the following nonmetallic minerals had the largest increases in 2010, in order of increase: marble (58%), fuller's earth (57.5%), kaolin (54%), dolomite (53%), and graphite (23%). In terms of volume of output, celestite production dropped by 13% in 2010 compared with that of 2009, and gypsum, mica, and perlite production decreased by 38% each (table 1; Cámara Minera de México, 2011, p. 74).

The Rofomex phosphate rock mine, which is located in San Juan de la Costa in the State of Baja California Sur and is operated by Roca Fosforica de Mexico (a subsidiary of Grupo Fertinal S.A. de C.V), was reactivated in 2007 and had showed an increase in production of phosphate rock of 1,962% in 2008 compared with that of 2007. By 2010, production had continued to increase but at a slower pace, recording an increase of 6% in 2010 compared with that of the previous year. The mine had been inactive between 2001 and 2007, owing to damage to the installations by Hurricane Juliette and later because of litigation between Fertinal and its insurers (table 1; Insurance Journal, 2007).

The municipality of Mulege, which is located in the State of Baja California Sur, was where more than 55% of the national production of gypsum took place. The principal producer of gypsum in Mexico was Compañia Occidental Mexicana S.A. de C.V (tables 1, 2; Cámara Minera de México, 2011, p. 137).

Mineral Fuels

Coal.—Mexico's production of coal in 2010 totaled 27.56 Mt, which was an increase of 19.6% compared with that of 2009. The main companies that produced coal in Mexico were Carbonifera San Patricio S.A. de C.V., GAN, Grupo México, and Materiales Industrializados S.A. de C.V. (Minsa). The distribution of production among the main concession holders was as follows: GAN (84%), Minsa (13%), Grupo México (1.8%), Carbonifera San Patricio (about 1%), and the remainder, Energia y Mineria del Noroeste S.A. de C.V. (table 1; Cámara Minera de México, 2011, p. 22).

Crude Petroleum and Natural Gas.—Although demand for petroleum had increased, crude petroleum production by PEMEX had been decreasing in the past several years, partly owing to Mexico's declining reserves and partly owing to a past history of lack of investment, exploration, and development of new projects. In 2010, however, these issues appeared to have been addressed, as the decreased production trend slowed; production was more than 940 million barrels, which was a decrease of less than 1%. Gross natural gas production also decreased by less than 1%, practically retaining its previous level of production at 72,615 million cubic meters (table 1; Petróleos Mexicanos S.A. de C.V., 2011, p. 4).

Outlook

The year 2010 marked a clear recovery for the Mexican mineral industry, in particular the metals sector. This sector represented the most dynamic and profitable part of the mineral industry, just as it has traditionally been. Gold and silver exploration is set to continue, and new projects are slated to reach their productive stages in 2011, including the San Jose silver mine in the State of Oaxaca. Industrial minerals are expected to continue to play an important role in Mexico's exports and imports; however, as in previous years, their production and further investment in the industry still will depend directly on the world demand for these products.

The mineral industry as a whole represents a very important source of foreign currency for Mexico, competing with the oil industry, tourism, and remittances by nationals living abroad. This trend is expected to increase as the prices of such commodities as copper, gold, and silver increase. The Mexican Government expects the country's economic recovery to continue and that the economy will grow at its forecasted rate of 4% for 2011. The Government expects to continue with a controlled inflation; however, this will probably be the

Government's greatest challenge. The Mexican Government estimates that growth in the coming years will be closely tied to that of the United States, as the United States is Mexico's principal commercial partner. Keeping the exchange rate stable is a priority of the Government, and it has been moderately successful in doing so, thus creating a stable currency base for Mexico's trade. A possible currency appreciation could affect the country's exports, however. The Government's promotion of investment in the mineral sector is likely to continue through the Subsecretaria de Minas, which is a Government agency created in 2007 to coordinate and promote the development of the mineral industry in Mexico.

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TABLE 1
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	2006	2007	2008	2009	2010
METALS					
Aluminum, metal, secondary[e, 3]	600,000	600,000	600,000	600,000	600,000
Antimony[4]	778	414	380	74	71
Arsenic[5]	1,595	513	--	--	--
Bismuth:					
Mine output, Bi content[6]	1,186	1,170	1,132	854	982
Metal, refined	1,186	1,170	1,132	854	952
Cadmium:					
Mine output, Cd content	1,399	1,605	1,550	1,510	1,464
Metal, refined	1,396	1,605	1,550	1,510	1,464
Copper:					
Mine output, Cu content:					
By concentration or cementation	280,840	276,530	214,644[r]	170,597	168,855
Leaching, electrowon	46,696	58,972	53,975	57,151	68,754
Total	327,536[r]	335,502	268,619[r]	227,748	237,609
Metal:					
Anode and blister, primary	260,200	222,600	200,200	169,000	192,600
Refined:					
Primary	373,400	345,904	308,000	255,700	272,600
Secondary[e]	6,000	6,000	6,000	5,000	5,000
Total	379,400	351,904	314,000	260,700	277,600
Gold:					
Mine output, Au content kilograms	38,961	43,710	50,365[r]	51,393	72,596
Metal, refined do.	29,200	30,226	37,760	19,410	29,000
Iron and steel:					
Iron ore, mine output:[7]					
Gross weight thousand metric tons	10,983	10,916[r]	11,688	11,677	13,998
Fe content do.	6,590	6,550[r]	7,013	7,073	7,931
Metal:					
Pig iron do.	3,790	4,078	4,450	3,925	4,580
Direct-reduced iron do.	6,167	6,265	6,012[r]	4,147	5,368
Total do.	9,957	10,343	10,462	8,072	9,948
Ferroalloys, electric arc furnace:[8]					
Ferromanganese do.	62	70	97	42	81
Silicomanganese do.	97	109	114	85	134
Total do.	159	179	211	127	215
Crude steel do.	16,447	17,563	17,209[r]	13,957	16,710
Rolled products[9] do.	14,473	14,985	14,174[r]	12,994[r]	14,491
Lead:					
Mine output, Pb content	135,025	137,133	141,173	143,838	192,062
Metal:					
Smelter:					
Primary[10]	117,315	89,838	91,364	85,411	110,980
Secondary[e]	110,000	110,000	110,000	110,000	110,000
Total[e]	227,000	200,000	201,364	195,411	220,980
Refined:					
Primary[11]	117,315	89,838	91,364	85,411	110,980
Secondary[e]	110,000	110,000	110,000	110,000	110,000
Total[e]	227,000	200,000	201,000	195,000	221,000
Manganese ore:[12]					
Gross weight[e]	346,000	423,000	471,964	329,400	485,447
Mn content	124,417	152,446	169,907	118,577	174,761
Mercury, mine output, Hg content[e]	15	15	15	15	15
Molybdenum, mine output, Mo content	2,519	6,491	7,811	10,166	10,849

See footnotes at end of table.

TABLE 1—Continued

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010
METALS—Continued						
Silver:						
Mine output, Ag content	kilograms	3,028,395	3,135,430	3,236,312	3,553,841	4,410,749
Metallurgical products, Ag content:						
In copper bars	do.	272,432	238,755	154,266	104,922	--
Mixed gold and silver bars	do.	147,089	224,765	207,457	353,930	572,901
Metal, refined, primary	do.	1,749,144	1,665,618	2,101,454	1,845,029	2,230,024
Tin:						
Mine output, Sn content		--[r]	--[r]	--[r]	--	--
Metal, smelter, primary		25	19	15	--	--
Zinc:						
Mine output, Zn content		468,924	452,012	453,588	489,766	570,004
Metal, refined, primary		279,734	321,932	305,188	313,044	322,508
INDUSTRIAL MINERALS						
Abrasives, natural[13]		--	--	--	--	--
Barite		199,605	185,921	140,066	152,790	143,225
Cement, hydraulic[14]	thousand metric tons	40,362	40,670	37,139[r]	35,160	34,503
Clays:						
Bentonite		435,273	613,895	374,933	511,429	590,998
Common		38,527,423	37,970,190	40,522,818	10,036,832	9,111,988
Fuller's earth		102,400	34,175	66,123	108,139	170,350
Kaolin		961,800	86,784	85,092	78,086	120,094
Diatomite		62,948	82,519	128,536	80,807	91,710
Feldspar		459,209	438,696	445,519	347,510	398,849
Fluorspar:						
Acid-grade	thousand metric tons	466	630	592	641	719
Metallurgical-grade	do.	470	303	466	405	348
Total	do.	936	933	1,057	1,046	1,067
Graphite, natural, amorphous		11,773	9,900	7,229	5,105	6,628
Gypsum and anhydrite, crude (yeso)		6,075,893	5,963,715	5,135,151	5,756,936	3,559,579
Lime, hydrated and quicklime[e]	thousand metric tons	--[r]	--[r]	--[r]	--[r]	--
Magnesium compounds:						
Magnesite		33,000	33,900	43,053	34,700	39,400
Magnesia[15]		87,520	79,135	85,477	72,600	84,200
Mica, all grades		150	9,600	5,000	5,000	160
Nitrogen, N content of ammonia		486,624	624,720	736,512	861,034	824,373
Perlite		81,719	54,405	43,180	51,395	31,779
Phosphate rock[16]		7,500	14,100	290,728	426,547	452,220
Salt, all types	thousand metric tons	8,378	8,032	8,809	7,445	8,430
Sodium compounds:[e]						
Carbonate, soda ash, synthetic		290,000	290,000	290,000	290,000	290,000
Sulfate, natural, bloedite[17]		652,000	645,000	658,000	646,000	660,000
Stone, sand and gravel:						
Calcite, common		1,934,483	2,483,605	2,352,109	2,555,544	3,183,209
Dolomite		1,282,590	1,123,225	1,233,993	982,650	1,499,744
Limestone	thousand metric tons	69,822	62,600	64,857	62,000	64,678
Marble		4,404,288	3,547,081	2,495,649	2,800,512	4,431,447
Quartz, quartzite, glass sand (silica)		2,661,770	2,950,438	2,779,075	2,483,605	2,607,650
Sand	thousand metric tons	62,248	68,141	72,570	89,172	89,036
Gravel	do.	68,017	78,233	87,416	78,777	76,789
Strontium minerals, celestite		128,321	96,902	29,621	36,127	31,429
Sulfur, elemental, byproduct:						
Of metallurgy[e]	thousand metric tons	650	550	700	700	800
Of petroleum and natural gas	do.	1,074	1,026	1,041	1,114	992
Total[e]	do.	1,720	1,580	1,741	1,814	1,792
Talc		40,535	32,410	17,576[r]	33,421	870
Vermiculite		177	102	132	291	98
Wollastonite		44,280	50,809	46,844	29,728	46,548

See footnotes at end of table.

TABLE 1—Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2006	2007	2008	2009	2010
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Run of mine:						
Metallurgical	thousand metric tons	4,309	4,755	5,491	13,555	16,318
Steam	do.	6,573	7,132	10,403	9,496	11,247
Total	do.	10,882	11,887	15,894	23,051	27,565
Washed metallurgical coal[e]	do.	2,000	2,000	2,000	2,000	2,000
Coke:[18]						
Metallurgical	do.	1,529	1,449	1,459	1,240 [r]	1,553
Breeze	do.	40	87	88	75 [r]	95
Total	do.	1,569	1,536	1,547	1,315 [r]	1,648
Gas, natural:						
Gross	million cubic meters	55,364	62,613	71,523	72,660	72,615
Marketable (dry)	do.	35,610	36,654	31,897 [r]	32,237	33,632
Petroleum:						
Crude	thousand 42-gallon barrels	1,188,440	1,124,930	1,019,080	949,365	940,240
Condensate, natural gas liquids	do.	155,855	144,175	133,590	135,050	137,605
Total	do.	1,344,295	1,269,105	1,152,670	1,084,415	1,077,845
Refinery products:						
Liquefied petroleum gas	do.	9,271	9,709	9,454	9,891	9,308
Motor gasoline	do.	166,513	166,586	164,506	172,097	154,833
Jet fuel	do.	23,652	24,200	23,360	20,841	18,944
Distillate fuel oil, diesel	do.	119,757	121,910	125,378	123,005	105,668
Lubricants	do.	1,862	1,898	1,862	1,533	1,570
Residual fuel oil	do.	118,698	110,048	105,376	115,413	117,530
Asphalt	do.	11,790	11,644	12,520	11,643	9,089
Other, refinery fuel and losses	do.	33,798	33,212	34,201	36,900	11,571
Total	do.	485,341	479,207	476,655	491,323	428,513

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto. NA Not available. -- Zero.

[1] Table includes data available through January 31, 2012.

[2] In addition to the commodities listed, additional types of crude construction materials are produced, but output is not reported, and available information is inadequate to make reliable estimates of output.

[3] Primary production of aluminum ceased after the closing of Aluminios y Derivados de Veracruz (Aluder) because of high energy costs.

[4] Sb content of antimonial lead.

[5] Arsenic content of white arsenic.

[6] Refined metal. Bismuth content of impure smelter products is no longer reported.

[7] Iron ore pellets.

[8] Reported by Cámara Nacional del Hierro y del Acero.

[9] Includes flat, nonflat, and seamless pipe steel products.

[10] Lead content of impure bar, antimonial lead, and refined metal.

[11] Includes lead content of antimonial lead.

[12] Mostly oxide nodules; includes smaller quantities of direct-shipping carbonates and oxide ores for metallurgical and battery applications.

[13] The previous series, which was based on exports made up mostly of pumice stone and emery (a granular, impure variety of corundum), is believed to be incomplete. Available information is inadequate to make reliable estimates of output.

[14] Includes gray and white portland and masonry cement.

[15] Reported by Industrias Peñoles, S.A.B. de C.V. as the only major producer. Includes caustic, electromelt, hydroxide, and refractory.

[16] Includes only output used to manufacture fertilizers.

[17] Series reflects output reported by Industrias Peñoles, S.A.B. de C.V. plus an additional 40,000 metric tons of estimated output by other producers.

[18] Includes coke made from imported metallurgical coal.

TABLE 2
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Antimony	Cía. Minera y Refinadora Mexicana, S.A. (private Mexican, 51%, and Cookson Ltd., 49%)	San Jose Mine, Catorce, S.L.P.	365.
Barite	Barita de Sonora, S.A. [Grupo Acerero del Norte, S.A. de C.V. (GAN), 100%]	Mazatan, Son.	219.
Do.	Minerales y Arcillas, S.A. de C.V. (private Mexican, 100%)	San Francisco del Huerto Mine in San Pedro, Coah., La Escondida and Angelita Mines and plant in Galeana	55.
Do.	Barita de Santa Rosa, S.A. de C.V. (private Mexican, 100%)	Muzquiz, Coah.	256.
Bismuth metric tons	Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Torreon, Coah.	1,200.
Cement	CEMEX México (Cementos Mexicanos, S.A.B. de C.V., 100%)	Ensenada, B.C.N.; Torreon, Coah.; Barrientos, D.F.; Arotonilco and Huichapan, Hgo.; Guadalajara and Zapotilic, Jal.; Hidalgo and Monterrey, N.L.; Tepeaca, Pue.; Tamuin and Valles, S.L.P; Hermosillo and Yaqui, Son.; and Merida,Yuc.	26,650.
Do.	Cementos Apasco, S.A. de C.V. (Holcim Group, 49%, and other, 51%)	Apasco, Mex.; Ramos Arizpe, Coah.; Macuspana, Tab.; Tecoman, Col.; Orizaba, Ver.; and Acapulco, Gro.	8,900.
Do.	Cooperativa La Cruz Azul, S.C.L. (private Mexican, 100%)	Cruz Azul, Hgo., Lagunas, Oax.	5,000.
Do.	Cementos de Chihuahua, S.A. de C.V. (CEMEX México, 36%, and private Mexican, 64%)	Chihuahua, Cuidad Juarez, and Samalayuca, Chih.	2,000.
Do.	Lafarge México (Lafarge Group, 100%)	Vito, Hgo.	600.
Do.	Corporación Moctezuma, S.A. (Cementos Molins, S.A., 50%, and Buzzi Unicem SpA, 50%)	Tepetzingo, Mor.	2,400.
Do.	Corporación Moctezuma, S.A. (Cementos Molins, S.A., 50%, and Buzzi Unicem SpA, 50%)	Cerritos, S.L.P.	2,400.
Coal	Minera Monclova, S.A. [Altos Hornos de México, S.A. de C.V. (AHMSA), 100%]	Mimosa and Palau Mines and Muzquiz washing plant at Palau, Coah., and coking plant at Monclova, Coah.	3,000.
Do.	Carbonífera de San Patricio, S.A. de C.V. (private Mexican, 100%)	Progreso, Coah.	1,314.
Do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)	Nueva Rosita, Coah.	1,500.
Do.	Minera Carbonífera Río Escondido, S.A. [Grupo Acerero del Norte, S.A. de C.V. [Altos Hornos de México (AHMSA), 100%]	Mina I, Mina II, and Tajo I at Nava and Piedras Negras, Coah.	6,500.
Copper	Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	La Caridad Mine, smelter, refinery, SX-EW[2] plant, and rod plant at Nacozari de Garcia, Son.	350 smelter, 50 SX-EW,[2] 300 refinery, 150 rod plant.
Do.	Mexicana de Cananea, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	Mine and SX-EW[2] plant at Cananea, Son.	29,200 mill, 33 SX-EW.[2]
Do.	Minera María S.A. de C.V. (Grupo Frisco, 100%)	Mine and SX-EW[2] plant at Cananea, Son.	20 SX-EW.[2]
Do.	Cobre de México, S.A. de C.V. (Grupo Condumex)	Primary refinery in Mexico City and secondary refinery in Villagran, Gto.	150.
Ferroalloys	Cía. Minera Autlán, S.A.B de C.V. (Grupo Ferrominero, S.A. de C.V., 54%; Minas de Basis, S.A. de C.V., 32%; BHP Billiton Ltd., 14%)	Plant in Tamos, Ver.	140.
Do.	do.	Plant in Teziutlan, Pue.	38.
Do.	do.	Plant in Gomez Palacio, Dgo.	35.
Fluorspar	Cía. Minera Las Cuevas, S.A. de C.V. (Mexichem, S.A. de C.V.)	Salitera (Zaragoza), S.L.P.	520.
Do.	Fluorita de México, S.A. de C.V. (Corp. Alfil, 51%, and Applied Industrial Minerals Corp., 49%)	Mines at La Encantada district and plant at Muzquiz, Coah.	150.

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Gold, mine	kilograms	Fresnillo plc. (Industrias Peñoles, S.A.B. de C.V., 77.1%)	Proaño (Fresnillo) Mine, Zac.	1,200.
Do.	do.	Minas de las Altas Pimerias, S.A. de C.V. (Goldcorp Inc., 100%)	El Sauzal Mine, Chih.	10,000.
Do.	do.	Fresnillo plc., 56%, and Newmont Mining Corp., 44%)	La Herradura Mine, Son.	6,900.
Do.	do.	Luismin, S.A. de C.V. (Goldcorp Inc., 100%)	San Dimas Gold, Dgo. (two mines)	6,500.
Do.	do.	Gammon Lake de Mexico, S.A. de C.V. (Gammon Lake Resources Inc., 100%)	Ocampo Mine, Chih.	5,000.
Do.	do.	Minera Mexicana La Ciénega, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	La Cienega Mine, Dgo.	4,500.
Do.	do.	Animas Resources Ltd. (Animas Resources Ltd., 100%)	Santa Gertrudis Mine, Son.	1,600.
Do.	do.	Cía. Minera El Cubo, S.A. de C.V. (Gammon Lake Resources Inc., 100%)	El Cubo Mine, Gto.	1,200.
Do.	do.	Pediment Gold Corp., 100%	La Colorada Mine, Son.	800.
Do.	do.	Alamos Gold Inc., 100%	Mulatos Mine, Son.	4,700.
Do.	do.	Great Panther Silver Ltd., 100%	Guanajuato, Gto.	438.
Gold, refined	do.	Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Torreon, Coah.	22,700.
Graphite		Grafitos Mexicanos, S.A. (Cummings Moore Graphite Co. of, 25%, and private Mexican, 75%)	Lourdes and San Francisco Mines, Son.	60.
Do.		Grafito Superior, S.A. de C.V. (Superior Graphite Co., 100%)	Covalmar, Santa Clara, and Rio Mayo Mines, and plant in Son.	25.
Gypsum		Cía. Occidental Mexicana, S.A. (private Mexican, 51%, and Domtar, Ltd., 49%)	Santa Rosalia on San Marcos Island, B.C.S.	2,500.
Iron ore		Consorcio Minero Benito Juárez Peña Colorada, S.A. de C.V. (ArcelorMIttal Holdings AG, 50%, and Grupo Imsa S.A. de C.V. 50%)	Peña Colorada mine and pellet plant near Manzanillo, Col.	3,500.
Do.		Altos Hornos de Mexico, S.A. de C.V. (AHMSA) [Grupo Acerero del Norte, S.A. de C.V. (GAN), 78.9%]	La Perla Mine, Chih.; Hercules Mine, Coah.; and Cerro de Mercado Mine, Dgo.	5,000.
Do.		Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. de C.V. (SICARTSA) (Grupo Villacero, 100%)	Ferrotepec, Volcan, and Mango deposits in Las Truchas project area and pellet plant, Mich.	2,350.
Do.		Hylsamex, S.A. de C.V., (Ternium S.A., 86.68%)	Cerro Nahualt, Col. and Aquila Mine, Mich.	1,500.
Lead and zinc		Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)	Charcas, S.L.P.; San Martin, Zac.; Santa Eulalia, Chih.; Taxco, Gro.; Rosario, Sin.; Santa Barbara, Chih.; Velardena, Dgo; lead refinery at Monterrey, N.L.; and zinc refinery at S.L.P.	70 lead, mine; 110 refined zinc.
Do.		Industrias Peñoles, S.A.B. de C.V. (private Mexican, 100%)	Mines at La Encantada, Coah.; Fresnillo, Zac.; Naica, Chih.; Bismark, Son; Rey de Plata, Gro. (Industrias Peñoles, S.A.B. de C.V., 51%, and Dowa Mining Co., 39%); metallurgical complex at Torreon, Coah., with silver, lead, and zinc smelter and refineries operated by Met-Mex Peñoles (Industrias Peñoles, S.A.B. de C.V., 100%)	180 refined lead, 240 refined zinc.
Do.		Industrias Peñoles, S.A.B. de C.V. (private Mexican, 97%, and private United States, 3%)	Francisco I. Madero Mine, Zac.	100,000 zinc.
Do.		Minera San Francisco del Oro, S.A. de C.V. (Empresas Frisco, S.A. de C.V., 100%)	San Francisco del Oro, near Hidalgo del Parral, Chih. Tayahua, Zac.	15 lead, 21 zinc.
Manganese		Cía. Minera Autlán, S.A. de C.V. (Grupo Ferrominero, S.A. de C.V., 81.75%, and private Mexican, 18.25%)	Molango, Naopa, and Nonoalco Mines, Hgo.	600 ore and concentrate.

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Molybdenum		Mexicana de Cobre, S.A. (Grupo México, S.A.B. de C.V., more than 90%)	La Caridad Mine and molybdenum plant, Son.	6.
Petroleum[3]	thousand barrels per day	Petróleos Mexicanos, S.A. de C.V. (PEMEX) (Government, 100%)	Comalcalco, Poza Rica, Ver., and Gulf of Campeche, Cam., Districts	3,500.
Salt		Exportadora de Sal, S.A. (Fideicomiso de Fomento 51%, and Mitsubishi Corp., 49%)	Solar salt complex at Guerrero Negro, B.C.S.	6,000.
Silver	kilograms	Fresnillo plc. (Industrias Peñoles, S.A.B. de C.V., 77.1%)	Proaño (Fresnillo) Mine, Zac.	1,100,000.
Do.	do.	Minera Mexicana La Ciénega, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	La Cienega Mine, Dgo.	65,800.
Do.	do.	Minera Bismark, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Bismark Mine, Chih.	7,000.
Do.	do.	Co. Minera Sabinas, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Sabinas Mine, Zac.	157,000.
Do.	do.	Minera Tizapa, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 51%; Dowa Holdings Ltd., 39%; Sumitomo Corp., 10%)	Tizapa Mine, Mex.	140,000.
Do.	do.	Minas Peñoles S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 50%)	Francisco I. Madero Mine, Zac.	63,000.
Do.	do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)	San Martin Mine, Sombrerete, Zac.; Taxco, Gro.; Charcas, S.L.P.; Santa Eulalia, Chih.; and refinery at Monterrey, N.L.	335,000.
Do.	do.	Pan American Silver Corp.	La Colorada Mine, Zac. and Alamo Dorado, Son.	100,000.
Do.	do.	Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Torreon, Coah.	2,900,000 refinery.
Do.	do.	Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A.B. de C.V., 100%)	La Caridad metallurgical complex, Son.	466,500.
Sodium sulfate		Química del Rey, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Plant at Laguna del Rey, Coah.	620.
Steel		Altos Hornos de Mexico, S.A. de C.V. (AHMSA) [Grupo Acerero del Norte, S.A. de C.V. (GAN), 78.9%]	Steelworks at Monclova, Coah.	3,316 steel, 3,800 pellet.
Do.		Hylsamex, S.A. de C.V. (Ternium S.A., 86.68%)	Steel works and direct-reduction units at Monterrey, N.L., and Puebla, Pue.; pelletizing plant in Col.	3,100 steel, 1,500 pellet.
Do.		DEACERO, S.A. de C.V. (private Mexican, 100%)	Steelworks at Saltillo, Coah., and Celaya, Gto.	1,450.
Do.		Mittal Steel Lazaro Cardenas (Mittal Steel, 100%)	Facilities at Lazaro Cardenas, Mich.	5,300 steel, 4,000 pellet.
Do.		Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. de C.V. (SICARTSA) (Grupo Villacero, 100%)	Port Lazaro Cardenas, Mich.	2,350 steel, 1,850 pellet.
Do.		Tubos de Acero de México, S.A. (private Mexican, 100%)	Veracruz, Ver.	1,000.
Strontium (celestite)		Cía. Minera La Valenciana (private Mexican, 100%)	San Agustin Mine, Torreon, Coah.	50.
Sulfur		Petróleos Mexicanos, S.A. de C.V. (PEMEX)	Nationwide petroleum operations	890.
Tin[4]		Fundidora Marni, S.A.	San Luis Potosi, S.L.P.	NA.
Do.		PIZUTO, S.A.	do.	NA.

Do., do. Ditto. NA Not available.

[1] State abbreviations used in this table include the following: Baja California Norte (B.C.N.), Baja California Sur (B.C.S.), Campeche (Cam.), Chihuahua (Chih.), Coahuila (Coah.), Colima (Col.), Distrito Federal (D.F.), Durango (Dgo.), Guanajuato (Gto.), Guerrero (Gro.), Hidalgo (Hgo.), Jalisco (Jal.), Mexico (Mex.), Michoacan (Mich.), Morelos (Mor.), Nuevo Leon (N.L.) Oaxaca (Oax.), Puebla (Pue.), San Luis Potosi (S.L.P.), Sinaloa (Sin.), Sonora (Son.), Tabasco (Tab.), Veracruz (Ver.), Yucatan (Yuc.), and Zacatecas (Zac.).

[2] Solvent extraction-electrowinning.

[3] Petróleos Mexicanos, S.A. de C.V. operated six refineries with an installed capacity of 1.68 million barrels per day.

[4] Smelter output from mostly imported concentrates.

THE MINERAL INDUSTRIES OF PARAGUAY AND URUGUAY

By Alfredo C. Gurmendi

PARAGUAY

In 2010, the Paraguayan economy had a record growth rate of 15% compared with a decrease of 3.8% in 2009, which positioned Paraguay among those countries with the strongest economic growth in the entire Latin American and Caribbean region. Paraguay's gross domestic product (GDP) based on purchasing power parity increased to a revised $33.3 billion in 2010 from a revised $28.9 billion in 2009, or by more than 15.2%. This growth was fostered mainly by exports (36%), private investment (19.3%), and consumption (10.6%) (Banco Central del Paraguay, 2011a, p. 2–4; U.S. Central Intelligence Agency, 2011).

Paraguay welcomed foreign investment and its laws treat national and foreign investors on equal terms. Paraguay's foreign direct investment (FDI) inflows increased to $268 million in 2010 from $99 million in 2009, or by almost 171%. Paraguay was the only country in the Latin America and Caribbean region that showed such an increase in FDI with respect to that of 2009. This investment, mostly from the United States, went mainly to the industrial sector (35%), petroleum processing (30%), the financial sector (20%), and transportation (15%) (Economic Commission for Latin America and the Caribbean, 2011, p. 38).

Paraguay's mineral industries included the production of cement, iron and steel, and petroleum derivatives. Paraguay has considerable resources of industrial minerals, such as clays, dolomite, gypsum, kaolin, limestone, magnesium, and semiprecious stones; in addition, Paraguay's geology is favorable for deposits of natural gas and petroleum. To meet its crude oil and petroleum derivatives consumption in 2010, Paraguay relied on imports (International Monetary Fund, 2011; U.S. Energy Information Administration, 2011).

The country's Parana River is an immense source of hydroelectric power, and the Itaipu Dam, which is located along the river, is the world's second ranked hydroelectric power generator. The dam was built jointly with Brazil and continued to be operated by both Brazil and Paraguay. Other dams included the Central Acaray, which was managed by the Government-owned Administración Nacional de Electricidad, and the Yacyreta, which was a joint venture with Argentina (International Monetary Fund, 2011; U.S. Central Intelligence Agency, 2011; U.S. Department of State, 2011; U.S. Energy Information Administration, 2011).

Paraguay worked closely with its Southern Cone Common Market (MERCOSUR) partners (Argentina, Brazil, and Uruguay) on many economic, political, and social issues. In 2010, the country's exports amounted to $4.5 billion and included such products as cement, clays, cotton, electricity, leather, meat, soybeans, and wood. Paraguay's leading export partners were Uruguay (22%), Brazil (15%), Argentina and Chile (12% each), and the United States (2%). Paraguay's imports amounted to $9.4 billion worth of consumer goods, electrical machinery and equipment, fertilizers, manufactured goods, and mineral fuels and lubricants. Paraguay's leading suppliers were China (32%), Brazil (24%), Argentina (16%), and Japan and the United States (5% each). In 2010, the sectors that contributed to Paraguay's GDP were services (60%), agriculture (20%), and industry (16%). Paraguay also depended on trade with its partners in MERCOSUR, which, in terms of trade value, was the second ranked trade association in the Americas and the eighth ranked trade association worldwide (Banco Central del Paraguay, 2011b, p. 7; U.S. Central Intelligence Agency, 2011; U.S. Department of State, 2011; World Bank, The, 2011).

Production

In 2010, Paraguay produced mostly cement, clays, petroleum derivatives, pig iron, and steel. Data on mineral production are in table 1.

Structure of the Mineral Industry

The cement and petroleum industries of Paraguay continued to be owned by the Government (table 2). During the period 2007 through 2009, however, the structure of much of the country's mineral industry (including the steel industry) had changed to a privately owned and Government-regulated regime. The new regime is managed by the Dirección de Recursos Minerales (DRM), which is under the Paraguayan Ministerio de Obras Públicas y Comunicaciones [Ministry of Industry and Commerce] (MOPC), Viceministerio de Minas y Energía (VMME). The DRM helps foreign private companies navigate the process of obtaining the necessary approvals of permits and concessions to conduct hydrocarbon and mining prospection, exploration, and operation activities in the country. The Paraguayan Strategic Economic and Social Plan 2011–15 formulates policies related to economic growth and transparency and the investment climate. The country has abundant capacity to generate hydroelectricity; however, expanded demand could require additional investments in this sector in the foreseeable future (Economic Commission for Latin America and the Caribbean, 2011, p. 36–38; Ministerio de Industria y Comercio, 2011, p. 41–42).

Paraguay has regulations that encourage mineral investment in mine operations and mineral commodity exports. Latin American Minerals Inc. (LAMI) of Canada, a mineral exploration company, has the Chiriguelo niobium and rare-earth elements (REEs) project, the Itapoty diamond project, and the Paso Yobai gold project in Paraguay. On November 30, 2010, LAMI acquired 100% interest in the Chiriguelo carbonatite project, which represented a prime exploration target for niobium and REEs in northeastern Paraguay. The property consisted of an exploration concession for which technical approval and environmental permitting had been received from the Government of Paraguay. The 25,500-hectare Chiriguelo exploration concession was held by LAMI through its Paraguayan subsidiary Minera Itapora S.A. The Chiriguelo project is located approximately 500 kilometers (km) northeast of Asuncion. Stream sediment sampling on the Itapoty property identified many samples with kimberlite indicator minerals (KIMs), many with diamonds. The distribution of diamond and KIMs suggests multiple local sources. Geologic and geophysical evidence supports emplacement of diatremes and dykes, which are the likely sources of the diamond recovered in the sampling. At LAMI's Paso Yobai gold exploration project, additional drilling had identified intersections of high-grade gold (Latin American Minerals Inc., 2011).

Commodity Review

Metals

Iron and Steel.—In 2010, Paraguay produced 63,000 metric tons (t) of crude steel compared with 130,000 t in 2009 owing to an intense draught. The production of pig iron totaled 145,500 t in 2010, which was at the same level as that of 2009 (table 1; World Steel Association, 2011).

Industrial Minerals

Cement.—Industria Nacional del Cemento (INC), which was a Paraguayan state-owned company, was the only cement producer in Paraguay. INC produced about the same amount of cement as in 2009. The Villeta cement plant was expected to be able to meet about 20% of the future (2011 to 2015) demand for cement in Paraguay. In 2010, the National Customs Department expected imports of about 150,000 t of cement to satisfy 20% of Paraguay's consumption of 750,000 t; the remaining 80% (600,000 t) was expected to be met by domestic production (table 1).

Mineral Fuels and Related Materials

Paraguay imported most of the $700 million worth of natural gas and crude oil that it consumed from neighboring countries Argentina, Bolivia, Brazil, and Venezuela. Russia's Gazprom had expressed interest in carrying out exploration work in Paraguay and, if reserves were found, in forming a joint venture with the state-owned energy company Petróleos Paraguayos (Petropar) (Petróleos Paraguayos, 2011; Schipani, 2011).

Natural Gas.—Paraguay had the potential to produce natural gas; however, the country did not consume natural gas because of the lack of domestic production capacity and the absence of import pipelines. The MIC planned to install a biogas plant between Concepcion and San Pedro that would use banana, mango, and pineapple residues as feedstock. According to the MIC, German companies were interested in the project (Ministerio de Industria y Comercio, 2011, p. 40; Petróleos Paraguayos, 2011).

Petroleum.—State-owned Petropar had a monopoly on all sales and imports of crude oil and petroleum products in Paraguay. Petropar operated the country's only refinery, the 7,500-barrel-per-day (bbl/d) Villa Elisa unit. Paraguay consumed 28,000 bbl/d in 2010. Venezuela was considering building a heavy crude oil refinery in Paraguay to produce 20,000 bbl/d of gasoil. If the project comes to fruition, the output could help to satisfy Paraguay's crude oil demand for the foreseeable future. The Paraguayan Government announced that crude oil had been discovered in the western Chaco region and that exploration for crude oil in the Emilia prospect, which is located within the Boqueron field, would continue. In 2010, however, no hydrocarbon reserves had been proven at the Emilia prospect, which was considered the country's most prospective project. The recoverable resource at the Emilia prospect was estimated to be 40 million barrels of oil (Ministerio de Industria y Comercio, 2011, p. 33; U.S. Energy Information Administration, 2011).

Uranium.—Paraguay has potential for uranium deposits in the Yuty zone (Caazapa, San Antonio), which is located southeast of Asuncion. Cue Resources Ltd. (CRL) of Canada announced results from a recent (April 2011) drill program at the San Miguel zone on the company's 100%-owned Yuty project. As expected, the structure identified is much shallower than at CRL's San Antonio uranium deposit, which is located 10 km to the south. The drilling identified extensive zones of anomalous radioactivity south of an interpreted fault structure. This structure has the same trend and setting as the fault that bounds the northern limb of the San Antonio resource. Geologists believed the deposits to be related to findings in the same structural trend in Argentina, Bolivia, and Brazil. The Government announced the possibility of building a nuclear-powered electricity-generating plant using Yuty's uranium (Cue Resources Ltd., 2011; Webber, 2011).

Outlook

Paraguay's economic growth, which reached record levels in 2010, is expected to continue, and the laws that treat domestic and foreign investors on equal terms are expected to remain in place to attract foreign investment. LAMI is expected to continue exploring for new gold targets. In the cement industry, production is expected to increase to meet 80% of Paraguay's cement demand in the foreseeable future, and the remaining demand is likely to continue to be met by imports. The Paraguayan mineral fuels industry, however, is set to continue its exploration activities by 2012 and beyond because of the positive exploration results in the Chaco region. China, which is already invested heavily in energy and mineral resources elsewhere in Latin America, could extend its interests to Paraguay as well (Banco Central del Paraguay, 2011b; Latin American Minerals Inc., 2011; Webber, 2011).

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URUGUAY

Uruguay's GDP based on purchasing power parity amounted to $48 billion in 2010 compared with $44 billion in 2009. This represented a growth of 9.1%. The sectors that contributed to the country's GDP were services (68%), industry (22.8%), and agriculture (9.2%). The mining sector accounted for less than 1% of the GDP. Unemployment increased to 7.9% in 2010 from 7.6% in 2009. Uruguay's economy was characterized by an export-oriented agricultural sector. Uruguay's FDI inflows increased to $1.63 billion in 2010 from a revised $1.23 billion in 2009 (Banco Central del Uruguay, 2011; Economic Commission for Latin America and the Caribbean, 2011; International Monetary Fund, 2011; U.S. Central Intelligence Agency, 2011; World Bank, The, 2011).

Uruguay continued to produce significant quantities of clays, gold, gypsum, iron ore, sand and gravel, semiprecious gemstones, steel, and stone. In 2010, exports were valued at $6.7 billion and included such commodities as dairy products, dolomite, fish, gold, leather, meat, rice, and wool. Export partners included Brazil (21%), the United States (10.2%), Argentina (7.5%), Chile (5.5%), Russia (5.3%), and others (50.5%). Imports of such goods as chemicals, machinery, petroleum and derivatives, and vehicles were valued at $8.3 billion in 2010. Import partners included Brazil (18.6%), Argentina (16.7%), China (13.5%), Venezuela (9.1%), the United States (8.3%), Russia (4.2%), and others (29.6%). Uruguay had no proven crude oil or natural gas reserves but it does have substantial hydroelectric capacity (Banco Central del Uruguay, 2011; U.S. Central Intelligence Agency, 2011; U.S. Department of State, 2011).

Production

Data on mineral production are in table 1.

Structure of the Mineral Industry

The mineral industry of Uruguay was mostly owned by Uruguayan state-owned firms and privately owned companies (table 2).

Commodity Review

Metals

Gold.—Uruguay Mineral Exploration Inc. (UME) of Canada changed its name to Orosur Mining Inc. (OMI) effective on January 11, 2010. OMI was a fully integrated gold producer and exploration company focused on identifying and developing gold projects in Latin America. OMI operated the only producing gold mine in Uruguay (San Gregorio), and had assembled an exploration portfolio of high-quality assets in Uruguay. OMI's San Gregorio gold mine produced 1,736 kilograms (kg) (55,820 troy ounces) in 2010 compared with 1,690 kg (54,320 troy ounces) in 2009. OMI continued with its exploration program at the Arenal Deeps gold deposit and expected to complete an additional 15,000 meters (m) of drilling in early 2011 (table 1; Uruguay Mineral Exploration Inc., 2010; Orosur Mining Inc., 2011, p. 2).

Iron and Steel.—In 2010, Uruguay produced 66,000 t of crude steel compared with 70,000 t in 2009 (table 1; World Steel Association, 2011).

Iron Ore.—On August 4, Gladiator Resources Ltd. (Gladiator) of Australia entered into an option agreement with OMI for an area in the Isla Cristalina Belt (ICB) in northern Uruguay. Under the agreement, Gladiator could earn up to an 80% interest in this highly prospective mineralized region in Uruguay by completing a feasibility study by December 2015. Gladiator had the right to earn its interest in all minerals other than diamond, gold, and silver. The agreement provided for Gladiator to invest $1 million to earn 20% by the first half of 2011 and another $4 million by 2013 to earn an additional 31%; the company could earn an additional 29% by preparing a bankable feasibility study to start production of 400,000 metric tons per year (t/yr) of iron ore by early 2016 (Gladiator Resources Ltd., 2011, p. 2).

Zamin Ferrous Ltd. of Jersey [United Kingdom] was a mining and trading company with two world-class iron ore development and exploration projects in Brazil and Uruguay. Zamin planned to complete a $3 billion feasibility on the Valentines iron ore project in Uruguay by the end of 2011. Production of 18 million metric tons per year of pellet feed could begin by 2014. Valentines, which had 980 million metric tons (Mt) of iron ore reserves, would be a greenfield magnetite mining, processing, and exporting facility (Zamin Ferrous Ltd., 2011).

Industrial Minerals

Cement.—Cementos Artigas S.A. (CASA) was owned by Cía. Uruguaya de Cemento Portland S.A. (Cemolins International SL of Spain, 50%, and Uniland International B.V. of the Netherlands, 50%). CASA was the only cement producer in Uruguay; it had a production capacity of 620,000 t/yr. In 2010, CASA produced at full capacity (table 1; Cementos Artigas S.A., 2011).

Mineral Fuels

Natural Gas.—Two pipelines supplied Uruguay with natural gas from Argentina. The CR. Federico Slinger or Gasoducto del Litoral runs 20 km from Colon, Argentina, to Paysandu, Uruguay. The pipeline was constructed and operated by the Administración Nacional de Combustibles, Alcohol y Portland (ANCAP), and had an operating capacity of 138,800 cubic meters per day (4.9 million cubic feet per day). The Gasoducto Cruz del Sur (GCDS), which was operated by a consortium led by British Gas plc. of the United Kingdom, extends 210 km from Argentina's natural gas grid to Montevideo and had an operating capacity of 5.1 million cubic meters per day (180 million cubic feet per day). The GCDS project also held a concession for a possible pipeline extension of 870-km to Porto Alegre, Brazil. Argentina agreed to consider a plan that calls for the construction in Uruguay of a degasification plant to supply both countries with natural gas (Cortes, 2010; U.S. Energy Information Administration, 2011).

Russian companies Gazprom and Lukoil expressed interest in a tender for construction of a liquefied natural gas (LNG) regasification plant in Uruguay. Once the Government defines the tender rules, the LNG plant could come online by 2013. The LNG plant would be designed with a maximum capacity of 15 million cubic meters per day; during the first phase, the plant would be able to produce 10 million cubic meters per day (BNAmericas, 2011a).

Petroleum.—The state-owned oil company ANCAP and its Venezuelan counterpart, Petróleos de Venezuela S.A. (PDVSA), signed an agreement to enlarge Uruguay's La Teja refinery to double its processing capacity to 100,000 bbl/d from 50,000 bbl/d by early 2012, as well as to create a joint venture between ANCAP and PDVSA to exploit crude oil in the Orinoco oil belt. In Uruguay, petroleum products were the leading energy source and represented about 60% of the country's energy consumption. Uruguay relied completely on crude oil imports, mostly from Venezuela. In June, ANCAP launched Uruguay's offshore licensing round, offering 11 blocks for crude oil and natural gas exploration that covered areas ranging from 4,000 to 8,000 square kilometers each, with water depths ranging from 50 to 1,450 m. The diversification of Uruguay's energy sources could reduce its petroleum dependency to 38% by 2015 (Ministerio de Industria, Energía y Minería, 2011, p. 19; Petróleos de Venezuela S.A., 2011; U.S. Energy Information Administration, 2011).

YPF S.A. (a subsidiary of the Spanish oil firm Repsol YPF S.A.) won a bid to explore for oil along the coast of Punta del Este. Exploration was to take place in the first quarter of 2010. YPF would have a 40% stake in the project; the other partners were Petrobrás Uruguay (40%), which was a subsidiary of Petróleo Brasileiro S.A., and Portugal's GALP Energia, SGPS, S.A. (20%). YPF would operate the deepwater exploratory Block 3 and Petrobrás would operate the shallow water exploratory Block 4; both are located along the coast of Punta del Este. BP p.l.c. of the United Kingdom and Petrobrás were also part of the consortium (40%), and they invested a combined $100 million in the project in 2010. A consortium composed of Argentina's YPF, Brazil's Petrobras, and Portuguese company Galp won the exploration rights for two offshore blocks in the Punta del Este basin. ANCAP planned to offer 15 offshore exploration blocks in its upcoming Uruguay round 2 tender. The consortium was currently (2010) obligated only to complete seismic work, and drilling was not expected until 2014 (Turner, 2010; BNAmericas, 2011b).

Outlook

Uruguay's economy is expected to continue to grow during the period 2011 to 2015. This growth, however, is dependent on high continued prices for its exports, a strong currency, low international interest rates, economic stability within the MERCOSUR, and reliable supplies of imported natural gas and petroleum.

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TABLE 1

PARAGUAY AND URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2006	2007	2008	2009	2010[e]
PARAGUAY[2]						
Cement, hydraulic[e]	thousand metric tons	600	600	600	600	600
Clays:[e]						
Kaolin		66,000	66,000	66,000	66,000	66,000
Other, unspecified		230,000	230,000	230,000	230,000	230,000
Gypsum[e]		4,500	4,500	4,500	4,500	4,500
Iron and steel:						
Pig iron		136,000	148,000	145,420	145,500 [3]	145,500
Semimanufactures[e]		51,500	51,500	45,120 [3]	45,200	45,200
Steel, crude[4]		118,000	132,000	129,600	130,000	63,000 [3]
Lime[e]		90,000	90,000	90,000	90,000	90,000
Petroleum, refinery products:[e]						
Distillate fuel oil	thousand 42-gallon barrels	600	600	600	600	600
Gasoline	do.	660	660	660	660	660
Jet fuel	do.	20	20	20	20	20
Kerosene	do.	250	250	250	250	250
Liquefied petroleum gas	do.	630	630	630	630	630
Residual fuel oil	do.	460	460	460	460	460
Unspecified	do.	40	40	40	40	40
Total	do.	2,660	2,660	2,660	2,660	2,660
Pigments, mineral, natural, ocher[e]		250	250	250	250	250
Sand, including glass sand[e]		25,500	25,500	25,500	25,500	25,500
Stone:[e]						
Dimension	thousand metric tons	70	70	70	70	70
Crushed and broken:						
Limestone, for cement and lime		16,000	16,000	16,000	16,000	16,000
Marble		750	750	750	750	750
Other		2,000	2,000	2,000	2,000	2,000
Talc, soapstone, pyrophyllite[e]		200	200	200	200	200
URUGUAY						
Aluminum, secondary[e]		45	45	45	45	45
Barite[e]		15	15	15	15	15
Bentonite		515	515	515	515	515
Cement, hydraulic[5]	thousand metric tons	620	620	620	620	620
Clays, unspecified		82,162	82,200	82,200	82,200	82,200
Coke, gashouse[e]		5,000	5,000	5,000	5,000	5,000
Feldspar		2,470	2,500	2,500	2,500	2,500
Gemstones, semiprecious:						
Agate		18,369	18,400	18,400	18,400	18,400
Amethyst		468	500	500	500	500
Gold[6]	kilograms	3,000	2,820	2,182	1,690	1,736
Gypsum[e]	thousand metric tons	1,150	1,150	1,150	1,150	1,150
Iron and steel:						
Iron ore[e]		15,500	15,500	15,500	15,500	15,500
Metal:						
Ferroalloys, electric-furnace ferrosilicon crust[e]		200	200	200	200	200
Semimanufactures[e]		32,000	32,000	28,000	28,000	28,000
Steel, crude[4]		57,000	71,000	69,700	70,000	66,000
Lime[e]		10,000	10,000	10,000	10,000	10,000

See footnotes at end of table.

TABLE 1—Continued

PARAGUAY AND URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2006	2007	2008	2009	2010[e]
URUGUAY—Continued						
Petroleum, refinery products:[e]						
Distillate fuel oil[7]	thousand 42-gallon barrels	8,500	8,500	8,500	8,500	8,500
Gasoline	do.	1,850	1,850	1,850	1,850	1,850
Kerosene	do.	100	100	100	100	100
Liquefied petroleum gas	do.	1,000	1,000	1,000	1,000	1,000
Residual fuel oil	do.	3,650	3,650	3,650	3,650	3,650
Unspecified	do.	200	200	200	200	200
Total	do.	15,300	15,300	15,300	15,300	15,300
Sand and gravel:						
Sand, common	thousand metric tons	1,940	2,000	2,000	2,000	2,000
Gravel		68,309	68,400	68,400	68,400	68,400
Stone:						
Flagstone		5,900 [e]	6,000 [e]	6,000 [e]	6,000 [e]	6,000 [e]
Granite:						
Dimension		7,643	7,650	7,650	7,650	7,650
Crushed and broken, alum schist	thousand metric tons	700 [e]	700 [e]	700 [e]	700 [e]	700 [e]
Other, rough stone		10,300 [e]	10,300 [e]	10,300 [e]	10,300 [e]	10,300 [e]
Diorite	thousand metric tons	169	170	170	170	170
Dolomite		10,152	10,200	10,200	10,200	10,200
Limestone	thousand metric tons	1,200 [e]	1,200 [e]	1,200 [e]	1,200 [e]	1,200 [e]
Marble, in blocks and broken:[e]						
Onyx		120	120	120	120	120
Other, unspecified		40	40	40	40	40
Marl		6,320	6,400	6,400	6,400	6,400
Quartz		150	150	150	150	150
Other, including ballast	thousand metric tons	1,800	2,000	2,000	2,000	2,000
Sulfur, elemental, byproduct[e]		3,000	3,000	3,000	3,000	3,000
Talc, soapstone, pryophyllite		1,150	1,150	1,150	1,150	1,150
Tuff, tufa	thousand metric tons	250	250	250	250	250

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. do. Ditto.

[1] Table includes data available through June 30, 2011.

[2] In addition to the commodities listed, construction materials (clays, miscellaneous rock, sand, and weathered tuffs) were presumably produced, but available information is inadequate to make reliable estimates of output.

[3] Reported figure.

[4] Source: International Iron and Steel Institute.

[5] Source: Dirección Nacional de Minería y Geología (Minerals Questionnaire 2008-10) and Cementos Artigas S.A., July 2011.

[6] Source: Uruguay Mineral Exploration Inc. Data are for fiscal year ending March 31, 2011.

[7] Source: Administración Nacional de Combustible, Alcohol y Portland (ANCAP). Numbers were converted into 42-gallon barrels (bbl) from thousand cubic meters using the U.S. Energy Information Administration conversion factor of 1 cubic meter = 6.289812 bbl.

TABLE 2
PARAGUAY AND URUGUAY: STRUCTURE OF THE MINERAL INDUSTRIES IN 2010

Country and commodity		Major operating companies or deposits	Location or deposit name	Annual capacity
PARAGUAY				
Cement	thousand metric tons	Industria Nacional del Cemento (INC), 100%	Plantas Vallemi y Villeta	675
Petroleum, refinery products	thousand 42-gallon barrels	Petróleos Paraguayos (Petropar)	Villa Elisa refinery at Villa Elisa municipality	2,700
Steel	thousand metric tons	Consorcio Siderúrgico de Paraguay (Cerro Lorito, 67%, and Cooperativa de Trabajadores de ACEPAR, 33%)	ACEPAR steel mill at Villa Hayes	150
URUGUAY				
Cement	thousand metric tons	Cementos Artigas S.A. (Cia. Uruguaya de Cemento Portland S.A., 100%)	Mine and clinker plant in Lavalleja Department	620
Gold	kilograms	Uruguay Mineral Explration Inc. (UME), 100%	Minas de Corrales Gold in Rivera Department	3,000
Iron and steel	thousand metric tons	Gerdau Laisa S.A.	Gerdau Laisa S.A.	70
Petroleum, refinery products	thousand 42-gallon barrels	Administración Nacional de Combustibles, Alcohol, y Portland (ANCAP)	La Teja oil refinery near Montevideo	18,000

THE MINERAL INDUSTRY OF PERU

By Alfredo C. Gurmendi

In 2010, Peru occupied a leading position in the global production of the following mineral commodities: arsenic trioxide (fourth after China, Chile, and Morocco), bismuth (third after China and Mexico), copper (second after Chile), gold (sixth after China, Australia, South Africa, the United States, and Russia), lead (fourth after China, Australia, and the United States), molybdenum (fourth after China, the United States, and Chile), rhenium (fourth after Chile, Kazakhstan, and the United States), silver (first followed by China and Mexico), tin (third after China and Indonesia), and zinc (second after China). In Latin America, Peru was first in the production of bismuth, gold, lead, silver, tellurium, tin, and zinc, and second in the production of cadmium, copper, molybdenum, and selenium (Brooks, 2011a, b; Carlin, 2011a, b; Edelstein, 2011; George, 2011; Guberman, 2011; Ministerio de Energía y Minas, 2011a, p. 20–21; Polyak, 2011a, b; Tolcin, 2011).

Peru's gross domestic product (GDP) based on purchasing power parity increased to $275.7 billion in 2010 from $253.4 billion in 2009. As it recovered from the weak economic cycle of 2009, Peru's GDP grew at a rate of 8.8% compared with 0.9% in 2009. Peru's net monetary international reserves increased to $44.1 billion compared with $33.1 billion in 2009. Exports exceeded imports by $6.8 billion. According to registered statements submitted by companies and investors to ProInversión (as required by Article 19 of Legislative Decree No. 662), Peru's foreign direct investment (FDI) reached $20.8 billion in 2010 compared with a revised $19.4 billion in 2009, which represented an increase of 7.2%. This FDI provided Peru with additional benefits, such as technology transfer and management expertise. The main sources of private investment to Peru were Spain ($4.6 billion), the United States ($3.0 billion), South Africa ($2.0 billion), Chile ($1.6 billion), Brazil ($1.2 billion), and the United Kingdom ($1.1 billion), among others. The mining sector received the largest share of FDI ($4.8 billion, or more than 23.1%). Much of the investment was made in the past 5 years through the implementation of various projects. The major mining companies active in Peru, in terms of amount invested in new mine projects, were Anglo American Quellaveco S.A. (a subsidiary of Anglo American plc. of the United Kingdom); Compañía Minera Antamina S.A. (a subsidiary of BHP Billiton Ltd. of Australia, 33.75%; Xstrata Copper of Switzerland, 33.75%; Teck Cominco Ltd. of Canada, 22.5%; and Mitsubishi Corp. of Japan, 10%); Gold Fields La Cima S.A. (a subsidiary of Gold Fields Ltd. of Australia); Minera Yanacocha S.R.L. (a subsidiary of Newmont Mining Corp. of the United States and Compania de Minas Buenaventura S.A.A. of Peru); Sociedad Minera Cerro Verde S.A.A. (a subsidiary of Freeport-MacMoran Copper of the United States); Southern Peru Copper Corp. (a subsidiary of Grupo Mexico, S.A. de C.V.); Votorantim Metais Cajamarquilla S.A.; and Xstrata Tintaya S.A. (a subsidiary of Xstrata plc of Switzerland). Investments in the Peruvian mining sector, of more than $50 billion, were announced for the coming years (2011 through 2015). In 2010, FDI in the energy sector amounted to $2.8 billion and that in the hydrocarbons sector was $0.5 billion whereas the communications and financial sectors received $3.8 billion and $3.1 billion, respectively (Banco Central de Reserva del Perú, 2011, p. 17; Luna, 2011, p. 3, 30; Ministerio de Energía y Minas, 2011a, p. 44–47; ProInversión—Private Investment Promotion Agency in Peru, 2011).

In 2010, mining companies committed to invest $20.7 billion in 23 exploration projects. Among these companies, Jinzhao Mining Perú S.A. (a subsidiary of Nanjinzhao Group Co. Ltd., Zibo of China) committed to invest $3.3 billion in the Pampa de Pongo iron project, which is located in the Arequipa Region and was to start operations by 2012; Minmetals/Jiangxi Copper of China ($2.5 billion) would operate the Galeno copper project, which is located in the Cajamarca Region and was to start operations by 2014; Apurimac Ferrum S.A. (a subsidiary of Strike Resources of Australia) ($2.3 billion) planned to define the Apurimac iron project, which is located in the Apurimac Region and was to start operations in the near future; and Minera CN S.A.C. (a subsidiary of Metminco Ltd. of Australia) ($2.2 billion) planned to define the Los Calatos copper-molybdenum project, which is located in the Moquegua Region and was to start operations in the near future (Luna, 2011, p. 40, 42; Ministerio de Energía y Minas, 2011a, p. 48).

The country had 11 mine projects that had approved environmental impact assessments (EIA) and were under construction. A total investment of $16.6 billion had been committed for these projects. Among the investors, Xstrata Perú S.A. (a subsidiary of Xstrata Copper of Switzerland) had committed to invest $4.2 billion in Las Bambas copper project, which is located in the Apurimac Region and was to start operations by 2014; Minera Yanacocha had committed to invest $3.5 billion to operate the Minas Conga copper-gold mine, which is located in the Cajamarca Region and was to start operations by 2015; Anglo American Quellaveco S.A. had committed to invest $3.0 billion to operate the Quellaveco copper mine, which is located in the Moquegua Region and was to start operations by 2014; and Minera Chinalco Perú S.A. (a subsidiary of Chinalco-Aluminum Corp. of China) had committed to invest $2.2 billion to operate the Toromocho copper mine, which is located in the Junin Region and was to start operations by 2013 (Luna, 2011, p. 42–43; Ministerio de Energía y Minas, 2011a, p. 47).

Eight operating mines were in the expansion process, and a total investment of $5.1 billion had been committed for these expansions of existing operations. Among the operating companies involved, Compañia Minera Antamina had committed to invest $1.1 billion to expand the Antamina copper-zinc mine, which is located in the Ancash Region and was to start expanded operations by early 2012; Shougang Corp. of China had committed to invest $1.0 billion to expand the Marcona iron mine, which is located in the Ica Region and was to start expanded operations by early 2012; and Sociedad Minera Cerro Verde had committed to invest $1.0 billion to expand the Cerro Verde Mine, which is located in the Arequipa Region and was to start expanded operations by 2012 (Luna, 2011, p. 46; Ministerio de Energía y Minas, 2011a, p. 48).

The stability of the Peruvian judicial framework was fundamental to encouraging investment in the mining sector. The total committed investment in the mining sector for the period 2011 through 2016 was $42.5 billion, of which the leading countries and investors were China ($10.4 billion), Switzerland ($5.7 billion), the United States ($5.6 billion), Canada ($5.5 billion), the United Kingdom ($4.7 billion), Australia ($4.5 billion), and Mexico ($2.8 billion), among others (Luna, 2011, p. 42–44; Ministerio de Energía y Minas, 2011a, p. 48–49).

Private investment in Peru continued to increase owing to the country's macroeconomic stability and the involvement of operating companies with the communities where they operate. Also, foreign investment in the mineral sector continued to be strong because the country's legal framework with respect to the mineral industry was investor friendly and because the country continued to have positive economic growth (Ministerio de Energía y Minas, 2011c).

In 2010, investments in the mining sector increased by 47% and amounted to $3.7 billion. Major capital investments included Xstrata Tintaya's investment in the Antapaccay copper project in Cusco Region; Antamina's investment to increase the installed capacity of its concentrator plant by 20,000 metric tons per day (t/d); Yanacocha's investment in the engineering and design of the Minas Conga project, the expansion of the lixiviation areas in Chaupiloma Sur, and the construction of a central supply warehouse; and Southern Peru's investment to modernize and expand its facilities in Cuajone and Toquepala (table 2; Ministerio de Energía y Minas, 2011a, p. 50–51; 2011c–e; ProInversión—Private Investment Promotion Agency in Peru, 2011).

Petróleos del Perú S.A. (Petroperú), which was a state-owned company, was involved in the transportation, refining, and marketing of refined products and other derivatives of petroleum. Petroperú was excluded from the privatization process but was authorized to participate in the exploration for and production of hydrocarbons under law No. 28244 of June 2, 2004. The state agency Perúpetro S.A. was created on November 18, 1993 (law No. 26221) to be responsible for promoting investments in the Peruvian hydrocarbon sector. Perúpetro negotiates, signs, and administers hydrocarbon contracts for which Petroperú must compete with the private sector (Ministerio de Energía y Minas, 2011c, d).

In 2010, Perúpetro attracted investment of about $3.3 billion to the hydrocarbon sector. The Camisea Natural Gas Project received an investment of $1.3 billion, and investment in Camisea was expected to increase to $3.0 billion by 2013. PERU LNG, which was Camisea's liquid natural gas (LNG) project, was a partnership of Hunt Oil Co. of Dallas, Texas (50%), Repsol YPF, S.A. of Spain and SK Energy Co. Ltd. of the Republic of Korea (20% each), and Marubeni Corp. of Japan (10%). Construction of the PERU LNG plant, which would have the capacity to produce 4.4 million metric tons per year (Mt/yr) of LNG, continued on schedule, with initial delivery of LNG projected for mid-2012. The total project cost was estimated to be about $3.8 billion, which included financing costs (Camisea Project, 2011; ProInversión—Private Investment Promotion Agency in Peru, 2011).

Minerals in the National Economy

The combined value of the mining and hydrocarbon sectors decreased by 0.1% in 2010 compared with a small increase of 0.6% in 2009. The decrease reflected the lower rates of extraction of precious metals (gold and silver) and base metals (copper, lead, and zinc), plus tin, although it was partially offset by increased production of iron and molybdenum in response to the growing demand of Asian markets. Consequently, production in the mining sector decreased by 4.9% but was offset by increased production in the hydrocarbon sector of 29.5% compared with an increase of 16.1% in 2009. For the decade 2001 through 2010, annual growth for the two sectors combined averaged 5.3%. The mineral sector employed 135,673 people in 2010 compared with 125,603 in 2009; this did not include the nearly 62,000 active informal miners (table 1; Banco Central de Reserva del Perú, 2011, p. 28–29; Luna, 2011, p. 43; Ministerio de Energía y Minas, 2011a, p. 71–72).

Government Policies and Programs

Peru's laws with respect to domestic and foreign investors continued to be governed by such constitutional mandates as Legislative Decree No. 662 (promotion of foreign investment), which allows investors unrestricted access to all economic sectors; Legislative Decree No. 757 (framework for the development of private investment), which pertains to private investment growth; and Legislative Decree law No. 868 of May 1996 (Texto Unico Oficial) as approved by Supreme Decree No. 059–96–PCM, which promotes private investment in public infrastructure and utility works. Within the framework of Decree law No. 708 of November 1991 (promotion of investment in mining), Legislative Decree law No. 818 of April 1996 (incentives for investing in natural resources), and Supreme Decree law No. 162–92–EF of October 1992 (rules guaranteeing foreign investment), more than 250 domestic stability and guarantee contracts had been signed since 1993 (Banco Central de Reserva del Perú, 2011, p. 97; Luna, 2011, p. 4–5; Ministerio de Energía y Minas, 2011a, p. 44–69; 2011c).

Supreme Decree law No. 014–92–EM of June 1992 (the general mining law) and the Texto Unico Oficial provide guaranteed protections to mining ventures and contracts under the Peruvian Civil Code. Consequently, such ventures and contracts are immune from unilateral changes by any governmental authority in Peru without an appropriate legal or administrative remedy or arbitration by the Convenio Constitutivo del Centro Internacional de Arreglo de Diferencias Relativas a Inversiones [Formal Consent of the International Center for Settlement of Relative Differences on Investments] (Banco Central de Reserva del Perú, 2011, p. 104–105).

Peru enacted Supreme Decree law No. 047–2002–EF of April 2002 (import duties for capital goods) to reduce the duties paid to 7% from 20% and 12% on capital goods to be used in exploration and production of certain minerals, such as oil and gas in the Amazon region. Law No. 27623–EF was enacted in January 2002 to eliminate the 18% sales tax on capital goods and services for mineral exploration. Supreme Decree law No. 015–2004–PGM of January 2004 (legal framework for decentralization) was established to use revenues from mineral production to maximize the well-being of the local communities through economic growth, environmental protection, and social development in a sustainable way. Supreme Decree law No. 066–2005–EM of May 2006 (legal framework for creation of the Dirección de Gestión Social) was established to administer the corporate social responsibility program in the mining sector (Banco Central de Reserva del Perú, 2011, p. 104; Ministerio de Energía y Minas, 2011a, p. 78–81).

The Peruvian Constitution establishes equal protection for domestic and foreign investors who enter into agreements with the Government. Hydrocarbon law No. 26844 of May 1997 eliminated the exclusive rights of state-owned Petroperú to control the secondary recovery of crude oil, refining, and imports and subsequent resale of petroleum and byproducts. The Peruvian laws have attempted to ensure more-favorable minerals and crude oil and gas exploration and production contract terms for investors (Ministerio de Energía y Minas, 2011a, p. 12–17; 2011d; ProInversión—Private Investment Promotion Agency in Peru, 2011).

Legal procedures to obtain mining rights were made easier by the enactment of complementary legislation Supreme Decree law No. 018 of July 9, 1992. The Government relinquished its exclusive management of exploration, mining, smelting, and refining of metals and fuel minerals. Individuals and private companies are allowed to hold mining permits in Peru. In the legal framework for investment and taxation, no distinction is made among domestic and foreign investors, and consortia, corporations, and joint ventures formed in Peru or abroad. Municipalities and Regional governments in areas where mineral resources (metals and industrial minerals) are exploited receive 50% of the taxes collected to be invested in education and social programs (health, housing, and others) in conformance with the Canon Minero (Ministry Resolution No. 266–2002–EF/15 of May 1, 2002). The remittance of depreciation, dividends, and royalties abroad has no restrictions. Contracts can be signed by investors, and the Government guarantees the stability of legal commitments and taxes. To increase protection of investors' interests, Peru signed agreements with the World Bank's Multilateral Investment Guarantee Agency in April 1991, which was authorized by Legislative Decree law No. 25312, and with the Overseas Private Investment Corp. in December 2002, which was authorized by Legislative Decree law No. 25809 (Ministerio de Energía y Minas, 2011c; ProInversión—Private Investment Promotion Agency in Peru, 2011).

The Dirección General de Asuntos Ambientales (DGAA) of the Ministerio de Energía y Minas (MEM) has the responsibility to address environmental problems that result from energy and mining activities and is mandated to implement the laws and regulations of the environmental legal framework, such as Legislative Decree No. 613 of September 1990 (the environmental code) and Supreme Decree No. 016–93–EM of April 28, 1993 (the environmental regulation). The sustainable development model for the mining and energy sectors began in 1993 with regulations and procedures for the gradual reduction of pollution, which include economic development policies and environmental protection. The mining industry must comply by adjusting its ongoing operations to permissible effluent levels and its new operations by using cleaner technologies (Ministerio de Energía y Minas, 2011c; ProInversión—Private Investment Promotion Agency in Peru, 2011).

The DGAA evaluates and proposes the environmental regulations for the mining and energy sectors, which include the maximum emission levels that are compatible with the internationally accepted limits set by the United Nations and the World Bank, approves environmental impact assessments for new operations and environmental adjustment and management programs for ongoing ones, and administers the national environmental information system. The MEM is authorized to manage environmental affairs in the mineral sector, such as by establishing the environmental protection policy and maximum allowable levels for effluents, signing environmental administrative stability agreements, overseeing the environmental effect of operations, determining responsibilities, and imposing administrative sanctions. The oil companies, in particular, were under pressure because the number of operations in the Amazon Rain Forest—one of the world's most sensitive ecosystems—was increasing (Ministerio de Energía y Minas, 2011c; ProInversión—Private Investment Promotion Agency in Peru, 2011).

Production

In 2010, increases in mineral production were led by molybdenum (37.9%) and iron (36.7%); decreases in mineral production included lead (13.4%), gold (10.8%), tin (9.7%), silver (7.2%), zinc (2.8%), and copper (1.7%); significant production decreases in refined products were led by silver (65%), lead (13.4%), and copper (7%); and no production was reported for antimony, arsenic, bismuth, indium, and tellurium. These mineral output decreases were expected to be reversed in response to the growing demand of Asian markets and to metal price increases in the near future. Metal prices in 2010 compared with those of 2009 increased for tin (by 50.5%), copper (46.6%), silver (37.5%), zinc (30.8%), gold (25.8%), and lead (25.3%). The hydrocarbon sector's output increased by 29.5% owing to the increased extraction of natural gas mostly at Camisea. Crude oil output increased by 30.2%; it was expected to continue to increase in the near future owing to the 30 new oil exploration and long-term production contracts signed in 2010 (table 1; Banco Central de Reserva del Perú, 2011, p. 28–29; Ministerio de Energía y Minas, 2011b, e).

Structure of the Mineral Industry

The structure of the Peruvian mineral industry continued to change owing to the establishment of consortia in such deregulated industries as petroleum and natural gas, and of joint ventures in energy and mining projects. Increased numbers of domestic and foreign companies are participating in prospecting, exploration, production, and trade of minerals, natural gas, and petroleum. Foreign companies contracting with Perúpetro in the energy sector and with the state agency Centromín Perú S.A. in the mineral sector included Anglo American and BHP Billiton plc of the United Kingdom; Sulliden Gold Corp. Ltd. and Teck Cominco Ltd. of Canada; Hunt Oil Co. and Newmont Mining Corp. of the United States; Marubeni Corp., Mitsubishi Corp. and Mitsui & Co., Ltd. of Japan; Shougang Corp. and Zijin Mining Group of China; Peñoles S.A. of Mexico; SK Energy Co. Ltd. of the Republic of Korea; Repsol YPF of Spain; Vale S.A. and Grupo Votorantim Metais S.A. of Brazil, and Xstrata plc of Switzerland (table 2; Ministerio de Energía y Minas, 2011a, p. 50–51; 2011c–e).

After 7 consecutive years of expansion, the production of hydrocarbons increased by 29.5% in 2010. This growth resulted primarily from the increased production of natural gas (12.4%), which was associated with the initiation of Pluspetrol's exports of gas from lot 56 in June after the gas was processed in the Melchorita plant, which was operated by Peru LNG (a consortium integrated by Hunt Oil, Repsol YPF, SK Corp., and the Marubeni Co. of Japan). In 2010, this consortium signed an agreement with the Government to build a $3.8 billion natural gas liquefaction plant 169 km south of Lima to allow exports of Camisea's liquefied natural gas (table 2; Ministerio de Energía y Minas, 2011a, p. 50–51; 2011c–e; ProInversión—Private Investment Promotion Agency in Peru, 2011).

Private domestic interests owned most of the medium- and small-sized mining operations. More than 300 foreign mining companies had been established in Peru since 1990. Crude oil was transported through the country's 1,754 kilometers (km) of pipeline; natural gas and natural gas liquids, through 983 km of dual pipeline; and refined products, through 13 km of pipeline. Ports that were important to the mineral industry included Callao, Chimbote, Ilo, Matarani, Paita, Puerto Maldonado, Salaverry, San Martin, San Nicolas, and Talara on the Pacific Ocean, and Iquitos Pucallpa and Yurimaguas on the Amazon River and its tributaries. Peru had an installed electricity-generating capacity of 5,050 megawatts (MW), about 90% of which was in hydroelectric plants. The energy mix, by source, was hydroelectric (79%), fossil fuel (20%), and others (1%) (Ministerio de Energía y Minas, 2011a, p. 82–83; 2011d, e; U.S. Central Intelligence Agency, 2011).

Mineral Trade

In 2010, Peru's exports amounted to about $35.6 billion, which was 31.9% higher than that of 2009, and its imports amounted to more than $28.8 billion, which was 37.1% higher than that of 2009. The country's total trade balance recorded a surplus of about $6.8 billion compared with $5.9 billion in 2009. Peru's mining sector accounted for more than $21.7 billion of total export revenues in 2010 compared with almost $16.4 billion of total export revenues in 2009. In 2010, Peru's petroleum and derivatives sector accounted for about 8.7% ($3.1 billion) of total export revenues compared with about 7.1% ($1.9 billion) of total export revenues in 2009. In June 2010, Peru started exporting natural gas, which amounted to $284 million; the leading destinations for the natural gas exports were Spain ($87 million), the United States ($57 million), and the Republic of Korea ($44 million), among others. Peru's imports of crude oil and lubricants amounted to $2.9 billion in 2010 compared with $5.2 billion in 2009 (Banco Central de Reserva del Perú, 2011, p. 62–63; Luna, 2011, p. 3; Ministerio de Energía y Minas, 2011a, p. 8–9).

In 2010, the United States and China continued to be Peru's leading trading partners. The destination markets of Peruvian exports as a percentage of total exports were the United States (16.9%), China (15.4%), Switzerland (10.9%), Canada (9.4%), Japan (5.1%), Germany (4.3%), Chile (3.9%), and Spain (3.4%), among others. Peru's leading import partners were the United States (19.2%), China (16.7%), Brazil (7.3 %), Ecuador (5.0%), Chile (3.9 %), and Colombia and Japan (4.5% each), among others. The United States, China, Brazil, Japan, and Chile, in order of the value of the commodities imported, were the main importers of gold, copper, and molybdenum. Peru sold about 11% of its exports to other members of the Mercado Común Andino (ANCOM), whose members were Bolivia, Colombia, Ecuador, Peru, and Venezuela; about 3.1% to the Mercado Común del Cono Sur (MERCOSUR) countries of Argentina, Brazil, Paraguay, and Uruguay and associate members Bolivia and Chile; and 14.3% to other Latin American countries (Banco Central de Reserva del Perú, 2011, p. 63–64; Ministerio de Energía y Minas, 2011a, p. 9–10).

Commodity Review

Metals

Copper.—In 2010, the price of copper increased as a result of the recovery of global economic activity. The average price of copper increased by 46.6% compared with that of 2009 to $3.4 per pound after reaching a record of $4.4 per pound in December. This price increase was associated with growing tightness in the copper market owing to the increased demand by emerging economies and also to supply constraints in some producing countries. Peru produced 1.1 million metric tons (Mt) of copper (Cu content) in 2010, which was almost the same amount as in 2009. With this level of production, the country remained the world's second ranked producer (behind Chile), accounting for almost 8% of world production. The country's copper metal exports in 2010 totaled about 1.25 Mt and were valued at about $8.9 billion compared with 1.24 Mt valued at more than $5.9 billion in 2009; this nearly 51% increase in value compared with that of 2009 was owing to the increase in the price of copper to $3.21 per pound in 2010 from $2.16 per pound in 2009 (Banco Central de Reserva del Perú, 2011, p. 29, 31, 251; Ministerio de Energía y Minas, 2011a, p. 21–22, 35; 2011b).

Owing to China's increased demand for copper, the Chinese firm Aluminium Corp. of China (Chinalco) was planning to develop the Toromocho deposit, which contains 1.4 billion metric tons (Gt) of proven and probable reserves at a grade of 0.71% copper equivalent, and to produce 275,000 metric tons per year (t/yr) of copper metal by 2013. Consorcio Xiamen

Zijin Tongguan Investment Development Co. Ltd. (Zijin Mining Group) of China was also planning to develop the Rio Blanco copper project, which is located in the Department of Piura and contains 1.3 Gt of proven and probable reserves at a grade of 0.57% copper equivalent, to produce 25 Mt/yr of copper ore by 2015 (Luna, 2011, p. 29, 43, 48; Ministerio de Energía y Minas, 2011a, p. 50).

In 2010, Peru's planned investments of about $42.5 billion included mineral projects with advanced exploration, feasibility studies, and expansion work. More than 66.5% ($28.2 billion) of the planned investments were for copper projects, such as Las Bambas ($4.2 billion) and Los Chancas ($1.2 billion) copper deposits, which are located in the Department of Apurimac and were owned by Xstrata and Southern Copper, respectively. Other investments in copper deposits included the partnership of China Minmetals Corp. and Jiangxi Copper Co., Ltd. of China, which had acquired 93.9% interest in Northern Perú S.A.'s Galeno copper project in Celendin, Department of Cajamarca. The estimated investment in the Galeno copper project (which has reserves of 803 Mt at a grade of 0.63% copper equivalent) was $2.5 billion to produce copper metal by 2014. Southern Copper was planning to invest $600 million in additional exploration and to improve efficiencies at the Cuajone and the Toquepala copper mines by 2012 and to invest $950 million in its Tia María copper project, which is located in the Department of Arequipa, to produce 120,000 t/yr of copper metal by 2015. Other investments included an investment of almost $15 billion to explore 13 copper deposits located in the Departments of Ancash, Arequipa, Apurimac, Cajamarca, Cusco, Huancavelica, La Libertad, Lambayeque, and Moquegua between 2011 and 2016; Xstrata Copper's investment of $1.5 billion in the Antapaccay copper deposit in Cusco; and Rio Tinto's investment of $1.0 billion in La Granja copper deposit in Cajamarca (Banco Central de Reserva del Peru, 2011, p. 29, 31, 251; Luna, 2011, p. 41, 43, 48; Ministerio de Energía y Minas, 2011a, p. 51).

Gold.—In 2010, gold output was about 164.1 metric tons (t) compared with almost 184 t in 2009, which was a decrease of about 10.8%. This decrease was owing to the decrease in grades of ore at Minera Yanacocha and by decreased production by Barrick Gold Corp. of Canada, also owing to the lower production in its units at Alto Chicama and Pierina. The former unit had declining production because the mine's reserves were nearly depleted. Peru's gold exports in 2010 totaled about 196 t (6.3 million troy ounces) valued at about $7.8 billion compared with about 218 t (7.0 million troy ounces) valued at about $6.8 billion in 2009, which was an increase in value of more than 14.7%. In 2010, Peru's planned investments of about $5.8 billion were expected to include mineral projects with advanced exploration and environmental assessment work for gold, such as Minera Yanacocha's Pita cianuration plant at Yanacocha Mine ($270 million), its project at Chaquicocha ($400 million), and its Minas Conga project ($3.5 billion) in the Department of Cajamarca, which was expected to be completed by 2015; Buenaventura's Tantahuatay gold deposit ($56 million) in the Department of Cajamarca, which was expected to be completed by 2012; and Barrick's Lagunas Norte gold deposit ($400 million) in the Department of La Libertad, which was expected to be completed by 2012 (Banco Central de Reserva del Perú, 2011, p. 29–30, 251; Luna, 2011, 41, 43, 45; Ministerio de Energía y Minas, 2011a, p. 23–24).

Of the total gold output in 2010, large-, medium-, and small-scale producers reported production of about 145.1 t of gold, and an unknown number of gold placers and informal individual miners reported production of almost 19 t of gold. Placers accounted for about 11.6% of the gold produced in the country. The southeastern Andes had well-known gold placers on the Inambari River and its tributaries. Placer gold was produced mostly in the Inca and the Mariategui Regions and from rivers and streams throughout the jungle (Banco Central de Reserva del Perú, 2011, p. 29–30; Ministerio de Energía y Minas, 2011a, p. 24, 51).

Iron Ore.—Shougang Hierro Perú S.A.A. (a subsidiary of China's Shougang Corp.) continued to be Peru's sole iron ore producer (exclusively from the Marcona iron ore mine in the Department of Ica). Mine output increased to more than 6.1 Mt of iron content in 2010 from almost 4.5 Mt in 2009, or a 36.7% increase owing to increased demand from China. In 2010, iron ore exports increased to 7.7 Mt in 2010 from 7 Mt in 2009 at a value of $623 million compared with $299 million in 2009, or an increase in value of more than 108%. This increase in the value of iron ore was in response to higher prices ($67.6 per metric ton in 2010 and $42.6 per metric ton in 2009). In 2010, Peru's planned investments of about $6.6 billion were expected to include mineral projects with advanced exploration and environmental assessment work and expansion for iron, such as Shougang's Marcona Mine expansion ($1.0 billion) in the Department of Ica, which was completed in 2011; China's Nanjinzhao Group Pampa de Pongo iron project ($3.3 billion) in the Department of Arequipa, which was expected to be completed by 2012; Strike Resources Inc. of Australia's exploration of the Apurimac iron ore deposit ($2.3 billion), with plans to start operations by 2015; and Cuervo Resources Inc. of Canada's exploration of the Cerro Ccopane and the Huillque iron ore deposits, which are located in the Department of Cusco (Banco Central de Reserva del Perú, 2011, p. 34, 251; Luna, 2011, p. 45, 47, 48; Ministerio de Energía y Minas, 2011a, p. 29, 51).

Lead, Silver, and Zinc.—The production of lead content decreased to 261,978 t in 2010 from 302,459 t in 2009, or a decrease of 13.4%, mainly as a result of decreased production from El Brocal and the Volcan lead mines. Exports of lead amounted to 770,000 t valued at $1.58 billion in 2010 compared with 681,400 t valued at $1.12 billion in 2009; prices increased to $0.930 per pound in 2010 from $0.743 per pound in 2009. The production of silver content in 2010 decreased to 3,640 t from 3,923 t in 2009, or a decrease of 7.2%. Despite this decrease, Peru was the world's leading producer of silver, accounting for 16.7% of world production. Peru surpassed Mexico's and China's silver output of 3,500 t and 3,000 t, respectively, in 2010. The export value of silver amounted to $118 million in 2010 compared with $214 million in 2009; prices increased to $19.2 per troy ounce in 2010 from $13.2 per troy ounce in 2009. The Peruvian zinc industry produced about 1.47 Mt of zinc in concentrates in 2010 compared with about 1.51 Mt in 2009, or a decrease of 2.8%. The value of exports of zinc amounted to about $1.7 billion in 2010 compared with almost $1.2 billion in 2009; prices increased to $0.585 per pound in 2010 from $0.408 per pound in 2009 (Banco Central de Reserva del Perú, 2011, p. 29–32, 251; Ministerio de Energía y Minas, 2010a, p. 25–29, 35, 51).

Tin.—Production from Minsur's San Rafael Mine, which is located in the Mariategui Region, was 33,848 t in concentrate in 2010 compared with 37,503 t in 2009. Minsur's tin smelting and refining operations, which are located in Pisco, south of Lima, produced 36,451 t of metal in 2010 compared with a revised 34,388 t in 2009. Peru continued to be the leading tin producer in Latin America followed by Bolivia and Brazil. Minsur, which was the only fully integrated tin supplier in Peru, produced more than 14% of the world's output and exported 33,500 t valued at $663 million in 2010 compared with 38,000 t valued at $479 million in 2009; prices increased to $8.977 per pound in 2010 from $5.715 per pound in 2009 (Banco Central de Reserva del Perú, 2011, p. 29, 251; Ministerio de Energía y Minas, 2011a, 29, 35).

Industrial Minerals

Phosphate Rock.—Vale S.A. (Vale) of Brazil was planning an expansion of its Bayovar open pit in Sechura ($300 million) in the Department of Piura, which was to be completed in 2012. In 2010, Vale changed the Empresa Minera Regional Grau Bayóvar S.A.'s name to Cía. Minera Miski Mayo S.A.C. (CMM). In 2010, CMM's phosphate deposits (Bayovar project) produced about 48,500 t of phosphate rock, which was almost 28% more than in 2009. The 90,000-t/yr fertilizer plant that was operated by CMM produced an estimated 21,800 t of phosphate (P_2O_5) in 2010. CMM's Bayovar open pit contained a reserve base of 240 Mt of phosphate with a production capacity of 4 Mt/yr of phosphate concentrate with a minimum grade of 30% P_2O_5, which would be used to produce fertilizers. In 2010, Vale started exporting phosphate rock to Brazil, India, Mexico, and the United States (Luna, 2011, p. 45; Ministerio de Energía y Minas, 2011a, p. 30; Vale S.A., 2011).

Mineral Fuels

Coal.—Peru's largest coal deposits are located at Alto Chicama in La Libertad Department. Other known coal deposits occur in the Cuenca del Santa in the Marañon Region and the coal basins of Goyllarisquizga and Hatun Huasi in the Caceres Region of central Peru. In 2010, Peru's recoverable coal reserves were estimated to be 1.1 Gt, and coal production was 91,960 t compared with 142,089 t in 2009; the estimated consumption of coal was more than 1.3 Mt/yr and imports were about 1.2 Mt/yr and came mostly from Colombia (tables 1, 3; Ministerio de Energía y Minas, 2011a, p. 30–31; U.S. Energy Information Administration, 2011).

Natural Gas and Petroleum.—In 2010, Peru's recoverable (proven and probable) and possible resources of crude oil were estimated to be 6,000 million barrels (Mbbl); of liquefied natural gas (LNG), 1,337 Mbbl; and of natural gas, 881 billion cubic meters. The leading gasfields were the Aguaytia, which is located about 41 km west-northwest of Pucallpa, Ucayali Department, and had proven reserves of 8.5 billion cubic meters of gas and 9 Mbbl of natural gas liquids (NGL) and the Camisea gasfields in the Ucayali Basin, Cusco Department, which had proven reserves of 250 billion cubic meters of gas and 411 Mbbl of NGL. Natural gas production increased to 3,904 million cubic meters in 2010 from 3,474 million cubic meters in 2009. Pluspetrol S.A. of Argentina remained the major producer, accounting for 77.7% of the domestic production, followed by Aguaytia S.A. of Peru (11.0%), Petróleo Brasileiro S.A. (Petrobrás) of Brazil (5.5%), and others (5.8%) (Camisea Project, 2011; Ministerio de Energía y Minas, 2011e; U.S. Energy Information Administration, 2011).

The Camisea Project encompasses three segments—Upstream, Transportation, and Distribution of natural gas from the Camisea field—and is located in the Ucayali Basin in the Department of Cusco. Peru had received an investment of $1.1 billion to implement the three segments in 2009. Pluspetrol was planning to invest about $3.0 billion in Camisea's natural gas project by 2013 (Camisea Project, 2011; Ministerio de Energía y Minas, 2011e).

In 2010, crude oil production increased to about 92,500 barrels per day (bbl/d) from about 71,000 bbl/d in 2009. Production of petroleum derivatives increased to about 204,400 bbl/d from a revised 190,950 bbl/d in 2009. Peru imported an average of 99,500 bbl/d of crude oil and petroleum products to satisfy its internal consumption of 157,000 bbl/d. Peru's total crude oil production of 33.8 Mbbl in 2010 came from Pluspetrol (42%), Petrobrás (19%), Petrotech (16%), and others (25%) (table 1; Banco Central de Reserva del Perú, 2011, p. 34–36; Ministerio de Energía y Minas, 2011e; U.S. Energy Information Administration, 2011).

In 2010, the largest oil refinery in Peru continued to be La Pampilla, which had a designed capacity of about 110,000 bbl/d. The second largest oil refinery was Talara, which had a designed capacity of about 62,000 bbl/d. Other refineries had the following designed capacities: Conchan, 15,500 bbl/d; Iquitos, 10,500 bbl/d; Pucallpa, 3,300 bbl/d; and El Milagro, 1,700 bbl/d. Pluspetrol was planning to build the 5,200-bbl/d-capacity Shiviyacu petroleum refinery, which would be located in the Department of Loreto, by 2013. In 2010, refinery production came from La Pampilla (43.3%), Talara (35.2%), Conchan (15.0%), Iquitos (4.6%), Pucallpa (1.0%), and Milagro (0.9%) (Ministerio de Energía y Minas, 2011e).

Reserves and Resources

Table 3 lists the Peruvian reserves of major minerals, such as copper, gold, iron ore, lead, molybdenum, silver, and zinc, as of about January 1, 2011. Data are shown in terms of metal contained in ore for the base and precious metals or recoverable quantities of other mineral commodities, which included industrial minerals and mineral fuels. These mineral reserves represent "proven" (measured) and "probable" (indicated) categories and exclude quantities reported as "possible" (inferred). Reserves are defined as being well delineated and economically recoverable volumes of crude oil and natural gas from wells and minable ore from mines committed to production (U.S. Bureau of Mines and U.S. Geological Survey, 1980; Ministerio de Energía y Minas, 2011e).

Outlook

According to ProInversión, Peru continues to be on a path of steady economic growth, which seems to be sustainable. The international scenario in 2010 was marked by economic recovery in most countries, as well as by the beginning of a significant increase in commodity prices and increased international liquidity. In 2010, in response to a more favorable international environment and a domestic market driven by private investors' optimistic expectations, the mineral sector's contribution to the GDP of Peru was a record 8.8%. The mineral (metals, industrial minerals, and fuels) sector is expected to continue to attract capital flows (2011 through 2015) by way of new joint ventures and consortia, privatizations, and direct acquisitions. Increased demand for copper, gold, iron ore, and silver, and high metal prices are likely to encourage mining companies to invest in expanding and modernizing their operations. The liquefaction of Camisea's natural gas for export to China, MERCOSUR, and the North America Free Trade Agreement (Canada, Mexico, and the United States), and to other markets and trading partners is expected to increase Peru's mineral commodity exports further (Camisea Project, 2011; Ministerio de Energía y Minas, 2011a, p. 51, 2011e; ProInversión—Private Investment Promotion Agency in Peru, 2011; U.S. Department of State, 2011).

According to the Anuario Minero 2010, Peru's economy is committed to trade integration through about 100 mining companies and investors, most of them from Australia, Brazil, Canada, China, the European Union, Mexico, Switzerland, the United States, and others. Peru's legal framework is expected to continue to be favorable to foreign investments in the fields of energy, mining, and related industries. Continued privatization in the mineral sector and investment in every sector of the Peruvian economy, particularly in the mineral and energy sectors, are expected to generate additional investments. The inflow of long-term private capital to the mineral sector, which amounted to nearly $42.5 billion in 2010, is projected to increase to $52.2 billion in 2011 as increased funds are oriented to finance investment projects (Banco Central de Reserva del Perú, 2011, p. 34–35; Camisea Project, 2011; Ministerio de Energía y Minas, 2011a, p. 51; ProInversión—Private Investment Promotion Agency in Peru, 2011).

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TABLE 1
PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010[p]
METALS						
Antimony, metal		691	590	531	145	--
Arsenic, white[2]		4,399	4,321	4,822	301 [r]	--
Bismuth, metal		1,081	1,114	1,061	423	--
Cadmium, metal		416	347	371	289	357
Copper:						
Mine output, Cu content		874,602	1,018,155	1,107,789	1,113,454 [r]	1,094,162
Metal:						
Smelter		322,188	236,809	306,584	325,788	312,968
Refined, primary:						
Electrowon		173,871	172,118	160,078	162,795	153,022
Electrolytic		333,839	237,719	303,855	260,618	240,616
Total		507,710	409,837	463,933	423,413	393,638
Gold:[3]						
Mines	kilograms	187,026	153,863	163,162	166,780	145,085
Placers	do.	15,800	16,373	16,708	17,215	18,975
Total	do.	202,826	170,236	179,870	183,995	164,060
Indium	do.	6,000	5,000	6,000	2,000	--
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	7,138	7,614	7,823	6,698	9,160
Fe content	do.	4,939	5,186	5,244	4,490	6,140
Metal:[e]						
Pig iron	do.	330	330	330	330	330
Sponge iron	do.	80	80	80	80	80
Ferrosilicon		600	600	600	600	600
Steel:						
Crude		750,000	750,000	750,000	750,000	750,000
Ingots and castings	thousand metric tons	510	510	510	510	510
Semimanufactures		250	250	250	250	250
Lead:						
Mine output, Pb content		313,332	329,165	345,109	302,459	261,978
Metal		120,311	116,774	114,259	26,599	23,039
Manganese, mine output, Mn content[e]		200	200	200	200	200
Molybdenum, mine output, Mo content		17,209	16,787	16,721	12,297	16,963
Selenium, metal, refined	kilograms	75,390	60,000	60,000 [e]	61,000	59,000
Silver:						
Mine output, Ag content		3,471	3,501	3,686	3,923	3,640
Metal, refined		1,296	1,203	1,190	445	156
Tellurium, metal	kilograms	37,000	35,000	28,000	7,000	--
Tin:						
Mine output, Sn content		38,470	39,019	39,037	37,503	33,848
Metal[4]		40,495	36,004	38,865	34,388 [r]	36,451
Tungsten, metal[5]		128	366	456	634 [r]	716
Zinc:						
Mine output, Zn content		1,203,364	1,444,381	1,602,597	1,512,931 [r]	1,470,450
Metal		175,250	162,375	190,324	149,494	223,112
INDUSTRIAL MINERALS						
Barite		1,499	27,368	45,199	27,881 [r]	27,875
Boron materials, crude (borates)		--	233,991	349,891	187,221	187,200
Cement, hydraulic	thousand metric tons	5,782	6,208	6,862	8,100	8,100
Chalk		201,000	334,688	463,134 [r]	321,012 [r]	325,000
Clays:						
Bentonite		27,106	21,451	31,557	119,452 [r]	119,495
Fire clay[e]		6,000	6,000	6,000	6,000	6,000

See footnotes at end of table.

TABLE 1—Continued

PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2006	2007	2008	2009	2010[p]
INDUSTRIAL MINERALS—Continued					
Clays—Continued:					
Kaolin	5,049	4,772	13,215	9,655 [r]	9,347
Common clay	948,617	2,183,804	1,720,838	2,020,623 [r]	1,983,771
Diatomite	35,100	21,603	12,206	9,946	10,500
Feldspar	9,280	15,450	13,333	5,154 [r]	5,006
Gypsum, crude	151,000	334,688	335,000 [e]	335,000	321,012
Lime[e]	215,500 [6]	216,000	216,000	216,000	216,000
Nitrogen, N content of ammonia[e]	5,000	5,000	5,000	5,000	5,000
Phosphate rock:[e]					
Crude, gross weight	38,000	38,000	38,000	38,000	38,000
P_2O_5 content	17,075 [6]	17,100	17,100	17,100	17,100
Salt, all types	922,000	1,185,273	1,276,271	1,567,279	1,570,000
Stone, sand and gravel:					
Stone:[e]					
Dolomite	645	645	645	645	645
Flagstone	300,000	300,000	300,000	300,000	300,000
Granite	2,000	2,000	2,000	2,000	2,000
Limestone thousand metric tons	8,425 [6]	9,610 [6]	10,227 [6]	10,304 [6]	10,500
Marble	8,842 [6]	24,513 [6]	595 [6]	338 [6]	340
Onyx	150	150	150	150	150
Quartz and quartzite (crushed)	40,000	40,000	123,542 [3]	124,000	124,000
Shell, marl	4,000	4,000	6,210	6,200	6,200
Slate	30,110 [6]	10,844 [6]	42,436 [6]	16,440 [6]	16,500
Travertine[6]	129,805	284,755	231,887	97,852	97,586
Sand and gravel:					
Stone (Construction) thousand metric tons	1,773	2,659	5,798	5,504 [r]	5,562
Sand do.	2,042	2,248	2,802	2,891 [r]	3,522
Sulfur, elemental:[e]					
Native	100	100	100	100	100
Byproduct of metallurgy	204,000	204,000	204,000	204,000	204,000
Sulfuric acid, gross weight	623,000	623,000	623,000	623,000	623,000
Talc	20,700	23,096	17,984	13,359 [r]	13,296
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite, run-of-mine	26,717	227,088	65,038 [r]	66,244 [r]	63,382
Bituminous, run-of-mine	2,818	52,050	65,649 [r]	75,845 [r]	28,578
Total	29,535	279,138	130,687 [r]	142,089 [r]	91,960
Coke, all types[e]	10,000	10,000	10,000	10,000	10,000
Natural gas:					
Gross million cubic meters	1,775	2,676	3,387	3,474	3,904
Marketed do.	1,003	1,512	1,750	2,003	2,251
Natural gas liquids thousand 42-gallon barrels	14,640 [r]	14,391 [r]	16,671 [r]	27,550 [r]	30,963
Petroleum:					
Crude do.	28,314	28,146	28,027	25,927	33,759
Refinery products:					
Liquefied petroleum gas do.	2,286	2,363	2,468	2,177 [r]	2,424
Gasoline, motor do.	12,777	13,948	13,355	14,713 [r]	15,185
Jet fuel do.	3,722	4,144	4,416	4,703 [r]	5,290
Kerosene do.	960	818	598	338 [r]	80
Distillate fuel oil do.	17,598	19,018	19,519	25,819 [r]	24,606
Lubricants do.	423	406	326	331 [r]	315
Residual fuel oil do.	14,713	14,669	13,874	10,263 [r]	10,124
Asphalt do.	838	930	1,113	1,663 [r]	1,841
Other[7] do.	6,988	6,701	7,532	9,689 [r]	14,755
Total do.	60,305	62,997	63,201	69,696 [r]	74,620

See footnotes at end of table.

TABLE 1—Continued
PERU: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through November 30, 2011.

[2]Output reported by Doe Run Resources Corp.

[3]Peru's placer gold production was reported.

[4]Output reported by Minsur S.A.'s smelter.

[5]Reported figure. Source: Malaga Inc. (Pasto Bueno tungsten mine).

[6]Reported figure. Source: Ministerio de Energia y Minas del Perú.

[7]Includes refinery fuel and losses.

TABLE 2
PERU: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Antimony metric tons	Doe Run Resources Corp. (private, 100%)	Smelter at La Oroya, Junin Department	700
Barite	Barmine S.A. (private, 100%)	Santa Cruz de Cocachacra, Huarochiri, Lima Department	NA
Bentonite	Minerales Andinos S.A. (NL Industries Co., 90%)	Vichayal Mine, Piura Department	9
Bismuth metric tons	Doe Run Resources Corp. (private, 100%)	Refinery at La Oroya, Junin Department	1,000
Cement	Cementos Lima S.A. (private, 100%)	Atocongo Plant, Lima Department	3,500
Do.	Cementos Pacasmayo S.A.A. (private, 100%)	Pacasmayo Plant, La Libertad Department	1,000
Do.	Cemento Andino S.A. (private, 100%)	East Lima Plant, Lima Department	800
Do.	Cementos Yura S.A. (private, 100%)	Yura Plant, Arequipa Department	300
Do.	Cementos Sur S.A. (private, 100%)	Arequipa Plant, Arequipa Department	200
Copper	Southern Copper Corp. (SPCC) (Grupo Mexico, S.A. de C.V., 54.2%; Marmon Corp., 14.2%; Phelps Dodge Overseas Capital Corp., 14%; others, 17.6%)	Cuajone Mine, Moquegua Department	200
Do.	do.	Toquepala Mine, Tacna Department	170
Do.	do.	Cocotea, Simarrona, and Totoral Mines—electrowon, Tacna Department	60
Do.	do.	Smelter at Ilo, Moquegua Department	320
Do.	do.	Refinery at Ilo, Moquegua Department	300
Do.	Compañia Minera Antamina S.A. (CMA) (BHP Billiton plc, 33.75%; Xstrata Copper, 33.75%; Teck Cominco Ltd., 22.5%; Mitsubishi Corp., 10%)	Antamina Mine, Huari, Ancash Department	350
Do.	do.	Antamina concentrator, Ancash Department	1,500
Do.	Doe Run Peru S.R. Ltda. (private, 100%)	Cobriza, Huancavelica Department	70
Do.	do.	Smelter at La Oroya, Junin Department	65
Do.	do.	Refinery at La Oroya, Junin Department	60
Do.	Compañia Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	30
Do.	Compañia Minera Condestable S.A. (private, 100%)	Condestable Mine, Junin Department	20
Do.	Glencore International AG (private, 100%)	Casapalca, Lima Department	60
Do.	Volcan Compañia Minera S.A.A. (private, 100%)	San Cristobal, Mahr Tunel, and Andaychagua, Junin Department	60
Do.	Cía. Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	60
Do.	Xstrata Tintaya S.A. (Xstrata plc, 100%)	Tintaya Mine, Cusco Department	120
Do.	Sociedad Minera Cerro Verde S.A.A. (Freeport-McMoRan Copper and Gold Inc., 53.6%; Sumitomo Corp. and Sumitomo Metal Mining Co. Ltd., 21%; Compañia de Minas Buenaventura S.A.A., 18.5%; others, 6.9%)	Cerro Verde, Arequipa Department	270
Do.	do.	Electrowon plant at Cerro Verde, Arequipa Department	90

See footnotes at end of table.

TABLE 2—Continued
PERU: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Dolomite		Minera Baribent S.A. (private, 100%)	Esperanza, Ancash Department	25
Gold	kilograms	Minera Yanacocha S.R.L. (Newmont Mining Corp., 51.35%; Compañia de Minas Buenaventura S.A.A., 43.65%; The World Bank's International Finance Corp., 5%)	Yanacocha, La Quinua, and Maqui-Maqui Mines, Cajamarca Department	110,000
Do.	do.	Minera Barrick Misquichilca S.A. (Barrick Gold Corp., 100%)	Pierina, Cajamarca Department	40,000
Do.	do.	Compañia Minera Poderosa S.A. (private, 100%)	Poderosa, La Libertad Department	2,000
Do.	do.	Compañia de Minas Buenaventura S.A.A. (private, 100%)	Orcopampa, Arequipa Department	5,000
Do.	do.	Minas Arirahua S.A. (private, 100%)	Arirahua, La Libertad Department	2,000
Do.	do.	Asesoria Contable Minera S.A. (private, 100%)	Ocoña, Santa Clarita, Explatoro, and Molino de Oro, Arequipa Department	1,000
Do.	do.	Cia. Aurifera Rio Inambari S.A. (Cia. Minera del Sur S.A., 84%, and Aurifera Claudia, 16%)	Río Caichive, Madre de Dios Department	200
Do.	do.	Minera Aurifera Retamas S.A. (private, 100%)	Retamas, La Libertad Department	5,500
Do.	do.	Consorcio Minero Horizonte S.A. (private, 100%)	Parcoy, La Libertad Department	4,000
Do.	do.	Compañia Minera Sipán S.A.C. (private, 100%)	Sipan, Inca, La Libertad Department	4,800
Do.	do.	Compañia Minera Ares S.A.C. (private, 100%)	Ares, La Libertad Department	6,500
Do.	do.	Cia. Minera Aurifera Santa Rosa S.A. (private, 100%)	Santa Rosa, Puno Department	5,000
Do.	do.	Aruntani S.A.C (private, 100%)	Florencia and Santa Rosa Mines, Moquegua Department	6,500
Iron ore		Shougang Hierro Perú S.A.A. (Shougang Corp., 100%)	Marcona, Ica Department	13,000
Lead		Doe Run Peru S.R. Ltda. (private, 100%)	Smelter at La Oroya, Junin Department	150
Do.		do.	Refinery at La Oroya, Junin Department	125
Do.		Empresa Minera Los Quenuales S.A.	Izcaycruz, Lima Department	10
Do.		do.	Yauliyacu, Lima Department	15
Do.		Volcan Compañia Minera S.A.A. (private, 100%)	San Cristobal, Mahr Tunel, and Andaychagua, Junin Department	70
Do.		do.	Paragsha, Cerro de Pasco Department	85
Do.		Compañia Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	5
Do.		Compañia Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	40
Do.		Compañia Minera Milpo S.A. (private, 100%)	El Porvenir Mine, Cerro de Pasco Department	25
Do.		Compañia Minera Santa Luisa S.A. (private, 100%)	Huanzala Mine, Junin Department	40
Do.		Sociedad Minera El Brocal S.A.A. (private, 100%)	Colquijirca Mines, Cerro de Pasco Department	30
Do.		Corp. Minera Nor Perú S.A. (Pan American Silver Corp., 100%)	Quiruvilca, La Libertad Department	10
Molybdenum		Southern Copper Corp. (SPCC) (Grupo Mexico, S.A. de C.V., 54.2%; Marmon Corp., 14.2%; Phelps Dodge Overseas Capital Corp., 14%; others, 17.6%)	Cuajone, Moquegua Department and Toquepala, Tacna Department	NA
Do.		Sociedad Minera Cerro Verde S.A.A. (Freeport-McMoRan Copper and Gold Inc., 53.6%; Sumitomo Corp. and Sumitomo Metal Mining Co. Ltd., 21%; Compañia de Minas Buenaventura S.A.A., 18.5%; others, 6.9%)	Cerro Verde, Arequipa Department	2
Natural gas	million cubic meters per day	Pluspetrol Perú Corp. S.A. (Pluspetrol S.A., 36%; Hunt Oil Co., 36%; SK Corp., 18%; Tecpetrol del Perú S.A.C., 10%)	Camisea gas deposit, Cusco Department	NA
Do.	do.	Petrotech del Perú S.A. (Petroperú S.A., 100%)	Pucallpa, Loreto Department	120
Do.	do.	Aguaytia S.A. (Petroperú S.A., 100%)	Aguaytia gas deposit, Ucayali Department	80
Do.	do.	Pluspetrol S.A. (private, 100%)	Pucallpa, Loreto Department	60

See footnotes at end of table.

TABLE 2—Continued
PERU: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, crude	42-gallon barrels per day	Petrotech del Perú S.A. (Perupetro, 100%)	Onshore Piura Department; northeast and central jungle areas, Loreto Department	68,000
Do.	do.	Petróleo Brasileiro S.A. (Perupetro, 100%)	Pacific Coast, offshore Piura Department	30,000
Do.	do.	Pluspetrol S.A. (private, 100%)	Northeastern jungle, Loreto Department	90,000
Do.	do.	Occidental Petroleum Corp. (private, 100%)	Block 1-AB, northern jungle, Loreto Department	28,000
Petroleum products	do.	Refinería La Pampilla S.A. (RELAPASA)	Refinery La Pampilla, Lima Department	110,000
Do.	do.	Petroperú S.A.	Refineries Talara, Piura Departament	62,000
Do.	do.	do.	Refinery Conchan, Lima Department	15,500
Do.	do.	do.	Refinery Iquitos, Loreto Department	10,500
Do.	do.	do.	Refinery Pucallpa Ucayali Department	3,300
Do.	do.	do.	Refinery El Milagro, Amazonas Department	1,700
Do.	do.	Pluspetrol Norte S.A.	Refinery Shiviyacu, Loreto Department Moquegua Department	5,200
Phosphate rock	metric tons	Cía. Minera Miski Mayo S.A.C. (CMM) (Vale S.A., 100%)	Bayovar phosphate mine, Piura Department	90
Silica sand		Minera Baribent S.A. (private, 100%)	Maria and Martin Mines, Junin Department	27
Silver	kilograms	Empresa Minera Los Quenuales S.A.	Yauliyacu, Lima Department	150,000
Do.	do.	do.	Izcaycruz, Lima Department	20,000
Do.	do.	Doe Run Peru S.R. Ltda. (private, 100%)	Refinery at La Oroya	1,100,000
Do.	do.	Co. Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	46,500
Do.	do.	Compañía de Minas Buenaventura S.A.A. (private, 83%, and Centromín Perú S.A., 17%)	Julcani and Huachocolpa Mines, Huancavelica Department, and Uchucchacua Mine, Lima Department	350,000
Do.	do.	Compañía de Minas Buenaventura S.A.A. (private, 100%)	Orcopampa Mine, Arequipa Department	161,000
Do.	do.	Volcan Compañía Minera S.A.A. (private, 100%)	San Cristobal, Mahr Tunel, and Andaychagua, Junin Department	350,000
Do.	do.	Sociedad Minera Corona S.A. (private, 100%)	Hualgayoc, Cajamarca Department	175,000
Do.	do.	Compañia Minas Arcata S.A. (private, 100%)	Arcata, Arequipa Department	170,000
Do.	do.	Southern Copper Corp. (SPCC) (Grupo Mexico, S.A. de C.V., 54.2%; Marmon Corp., 14.2%; Phelps Dodge Overseas Capital Corp., 14%; others, 17.6%)	Ilo smelting and refining, Moquegua Department	150,000
Do.	do.	Compañia Minera Santa Luisa S.A. (private, 100%)	Huanzala Mine, Junin Department	53,000
Do.	do.	Compañia Minera Antamina S.A. (CMA) (BHP Billiton plc, 33.75%; Noranda Inc., 33.75%; Teck Cominco Ltd., 22.5%; Mitsubishi Corp., 10%)	Antamina Mine, Huari, Ancash Department	340,000
Do.	do.	Aruntani S.A.C (private, 100%)	Florencia and Santa Rosa Mines, Moquegua Department	14,500
Do.	do.	Compañia Minera Raura S.A. (private, 100%)	Raura, Lima Department	54,000
Do.	do.	Compañia Minera Milpo S.A. (private, 100%)	Yanacancha, Cerro de Pasco Department	110,000
Do.	do.	Compañia Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	130,000
Do.	do.	Sociedad Minera El Brocal S.A.A. (private, 100%)	San Gregorio Mine, Cerro de Pasco Department	110,000
Do.	do.	Corp. Minera Nor Perú S.A. (Pan American Silver Corp., 100%)	Quiruvilca, La Libertad Department	125,000
Steel		Sider Corp. S.A. (Acerco S.A., 49.4%; Grupo Wiese, 49.4%; others, 1.2%)	Chimbote, Ancash Department	550
Do.		Empresa Laminadora del Pacifico S.A. (Acero Arequipa S.A., 100%)	Pisco, Ica Department	180
Tellurium	metric tons	Doe Run Peru S.R. Ltda. (private, 100%)	Refinery at La Oroya	12

See footnotes at end of table.

TABLE 2—Continued
PERU: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Tin	metric tons	Minsur S.A. (private 100%)	San Rafael Mine and plant, Puno Department	50,000
Do.	do.	do.	Pisco smelting and refining, Ica Department	45,000
Tungsten	do.	Minera Regina S.A. (private, 100%)	Palca XI, Puno Department	1,400
Do.	do.	Fermin Málaga Santolalla S.A. (private, 100%)	Pasto Bueno, Ancash Department	1,000
Zinc		Volcan Compañia Minera S.A.A. (private, 100%)	Cerro de Pasco, Cerro de Pasco Department; San Cristobal, Mahr Tunel, and Andaychagua, Junin Department	320
Do.		Compañía Minera Antamina S.A. (CMA) (BHP Billiton plc, 33.75%; Xstrata Copper, 33.75%; Teck Cominco Ltd., 22.5%; Mitsubishi Corp., 10%)	Antamina Mine, Huari, Ancash Department	325
Do.		do.	Antamina concentrator, Ancash Department	1,500
Do.		Empresa Minera Los Quenuales S.A.	Pachangara, Lima Department	200
Do.		do.	Izcaycruz, Lima Department	40
Do.		Compañia Minera San Ignacio de Morococha S.A. (private, 100%)	Yauricocha, Junin Department	80
Do.		do.	San Vicente Mine, Junin Department	70
Do.		Doe Run Peru S.R. Ltda. (private, 100%)	Refinery at La Oroya	70
Do.		Votorantim Metais - Cajamarquilla S.A. (Grupo Votorantim Metais S.A., 99%, and employees, 1%)	Refinery at Cajamarquilla, Lima Department	130
Do.		Compañia Minera Atacocha S.A. (private, 100%)	Yanacancha Mine, Junin Department	60
Do.		Compañia Minera Raura S.A. (private, 100%)	Raura, Lima Department	45
Do.		Corp. Minera Nor Perú S.A. (Pan American Silver Corp., 100%)	Quiruvilca, La Libertad Department	25
Do.		Compañia Minera Santa Luisa S.A. (private, 100%)	Huanzalá Mine, Junin Department	50
Do.		Compañia Minera Milpo S.A. (private, 100%)	Yanacancha, Cerro de Pasco Department	80
Do.		Sociedad Minera El Brocal S.A.A. (private, 100%)	Colquijirca Mines, Cerro de Pasco Department	60
Do.		Empresa Administradora Chungar S.A.C. (private, 100%)	Animon Mine, Cerro de Pasco Department	60

Do., do. Ditto. NA Not available.

TABLE 3

PERU: RESERVES OF MAJOR MINERALS IN 2010[1]

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Coal, all types		1,100,000
Copper		63,886 r
Gold	metric tons	2,206 r, 2
Iron ore		12,482
Lead		7,863
Molybdenum		450 e
Natural gas	billion cubic meters	881
Natural gas liquids	million barrels	1,337
Petroleum crude	billion barrels	1,200
Phosphate rock		820
Salt		100,000 e
Silver	metric tons	67,760 r
Sulfur		150,000 e
Tin		307
Uranium		100 3
Zinc		19,984 r

[e] Estimated; estimated data are rounded to no more than three significant digits.

[r] Revised.

[1] Proven reserves.

[2] Excludes metal in placer deposits.

[3] Recoverable at prices of $100 or less per kilogram of uranium.

Sources: 2010 and 2011 "Anuario de la Minería del Perú" Ministerio de Energía y Minas, except for natural gas and petroleum crude; BP Statistical Review of World Energy, June 2011; Perúpetro S.A., 2011; U.S. Energy Information Administration, 2011.

THE MINERAL INDUSTRY OF VENEZUELA

By Alfredo C. Gurmendi

Venezuela's gross domestic product (GDP) based on purchasing power parity decreased to $347.0 billion in 2010 from $348.6 billion (revised) in 2009, or by almost 0.5%. This decrease and lower crude oil prices affected the Government's budget and private consumption. In 2010, Venezuela's natural resources sector continued to be dominated by the hydrocarbon sector. Petroleum and natural gas production represented about 30% of Venezuela's GDP, more than 94% of its exports, and more than 50% of the central Government's revenues. Venezuela's leading produced mineral commodities, which consisted primarily of, in order of value, petroleum, natural gas, coal, bauxite, alumina and primary aluminum, iron ore and steel, gold, nickel, and diamond, represented less than 1% of Venezuela's GDP. The state-owned petroleum company Petróleos de Venezuela S.A. (PDVSA) continued to control the exploration for and production of asphalt, natural gas, and petroleum and its derivatives. PDVSA was a member of the Organization of the Petroleum Exporting Countries (OPEC) and an active participant in the global crude oil market. Venezuela accounted for almost 1.2% of the world's bauxite output, almost 1.1% of the world's aluminum output, and almost 1.0% of the world's nickel output in 2010 (table 1; Banco Central de Venezuela 2011; Bray, 2011a, b; International Monetary Fund, 2011; Kuck, 2011; Petróleos de Venezuela S.A., 2011; U.S. Central Intelligence Agency, 2011).

Minerals in the National Economy

PDVSA controls Venezuela's petroleum sector. Government companies also control the electricity sector and important parts of the telecommunications and media sectors. During 2009, the Government had nationalized assets in the banking, chemicals, and crude oil industries. The nationalization process, high inflation, and foreign exchange controls had led to reduced private investment. In 2010, Venezuela's leading mineral resources included, in order of value, petroleum, natural gas, coal, iron ore, gold, nickel, diamond, and bauxite. Petroleum exports accounted for 18% of Venezuela's GDP; the manufacturing sector accounted for 16%; construction, 7%; and mining, 1% (Banco Central de Venezuela, 2011; Petróleos de Venezuela S.A., 2011).

Government Policies and Programs

Under the Venezuelan Constitution, all mineral and hydrocarbon resources belong to the state. The mining law (Decree No. 295 of September 5, 1999) establishes the rules for all mines and minerals (except hydrocarbons and some industrial minerals not found on Government lands) within Venezuelan territory, including the exploration, development, production, marketing, and transportation of minerals. The Ministerio del Poder Popular para las Industrias Básicas y Minería (MIBAM) is responsible for all matters related to mining operations. Mining is allowed by the Government through concessions or under production authorization issued to artisanal miners, mining cooperatives, and other small-scale mining operations. The General Regulation of the Mining Law (Decree No. 1234 of March 9, 2001) establishes terms, conditions, and administrative procedures in support of Decree No. 295. Most industrial minerals found on private lands continue to be governed by Articles 7 through 10 of the Mining Law of 1945 until the individual States establish regulations. The Ministerio del Poder Popular para la Energía y Petróleo (MPE) manages the crude oil and natural gas sectors. The hydrocarbon law, which is known as the Decree with Force of Organic Law on Hydrocarbons (Decree No. 1510 of November 2001), and Article 302 of the Constitution of 1999 reserve all primary hydrocarbon activities for the state. The hydrocarbon law was amended in 2006 by the Partial Amendment Law to Decree 1510 with Force of Law, Organic Law of Hydrocarbons. Nonassociated gas (natural gas that is not produced simultaneously with crude oil) and downstream natural gas operations are excluded from the hydrocarbon law; they are regulated instead by the Decree with Rank and Force of Organic Law on Gaseous Hydrocarbons (Decree 310 of September 1999) and by the Regulation of the Law on Gaseous Hydrocarbons (Decree 840 of June 2000), as amended by the MPE's Resolution 244 of January 9, 2006 (Banco Central de Venezuela, 2011; Petróleos de Venezuela S.A., 2011).

The Norms of Environmental Evaluation of Activities Susceptible to Degrade the Environment (Decree No. 1257 of 1996) establishes the Ministerio del Poder Popular para el Ambiente (Minamb). The law requires an environmental impact study for projects and operations in the hydrocarbon and the mining sectors. The Minamb and the MPE implement Decrees No. 1510 and No. 1257 through the "Ley Orgánica del Ambiente" (Ministerio del Poder Popular para el Ambiente, 2010; República Bolivariana de Venezuela, 2010).

During 2009, the Government had passed a series of new laws, including laws to centralize control over ports, roads, and airports. In May 2009, Venezuela's Congress passed a crude oil services law that reserves to the central Government all primary hydrocarbon activity. This legislation laid the foundation for the expropriation of nearly 80 crude oil services companies, including three U.S. firms. In June 2009, the Government passed legislation that requires private-sector petrochemical producers to enter into joint ventures with the Government-owned chemicals company Petroquímica de Venezuela S.A. (Pequiven) in order to continue doing business in Venezuela. The Government would allow private sector consortia to negotiate the formation of joint ventures to produce crude oil and to develop heavy-crude-oil upgrades in the Carabobo region of the Orinoco Belt during 2010–11. Since 2008, owing to the Venezuelan Government's nationalization drive, such foreign investors as Eni S.p.A. of Italy, Statoil ASA of Norway, and

Total S.A. of France had entered into joint ventures with the Government in which the Government's equity share was 60% (Petróleos de Venezuela S.A., 2011; República Bolivariana de Venezuela, 2011, p. 6–7).

The Venezuelan Government imposes a windfall profits tax on royalties from oil projects when crude prices are above $40 per barrel. If crude remains above $90 during 2011, an estimated $9 billion could be collected; if Venezuela's oil prices top $110, an estimated $16.3 billion could be collected, mostly from foreign oil companies operating in the country (Sanchez, 2011).

The Venezuelan Government promotes technical and administrative audits for foreign and domestic oil companies interested in partnerships, within the framework of the strategic collateral plan called the National Social and Economic Development Plan for the period 2007–13 (República Bolivariana de Venezuela, 2011, p. 3–5).

Production

In 2010, Venezuela's production data for minerals are estimated owing to a lack of response to the USGS Minerals Questionnaire since 2005 (table 1). According to the BP Statistical Review of World Energy, Venezuela's crude oil production amounted to about 986 million 42-gallon barrels in 2010 compared with 890 million 42-gallon barrels in 2009, or a 1.4% increase. The country's gross natural gas production amounted to 28.5 billion cubic meters in 2010 compared with 28.7 billion cubic meters in 2009, or a 0.7% decrease (table 1; BP p.l.c., 2011b, p. 8, 22).

Structure of the Mineral Industry

The Government-owned mineral and industrial producer Corporación Venezolana de Guayana Minerven C.A. (CVG Minerven), its subsidiary companies, and the Instituto Nacional de Geología y Mina were units of MIBAM. The Government-owned Compañía Nacional de Industrias Básicas (a holding company under CVG Minerven) participated in the production of bauxite and alumina, aluminum, and iron ore. PDVSA continued to be responsible for the development and management of the hydrocarbon sector and produced about 70% of the national output of crude oil. As a PDVSA affiliate, CVG Minerven managed the Government's 32 operating service agreements (OSAs) with such international oil companies as BP p.l.c. of the United Kingdom and Chevron Corp. of the United States and the 8 risk- and profit-sharing agreements that accounted for about 20% of Venezuelan crude oil production in 2010. Corporación Venezolana de Petróleos (CVP), a wholly owned subsidiary of PDVSA, also managed four OSAs that produced and processed extra-heavy crude oil and accounted for about 10% of the total national output of petroleum. International companies dominated the cement sector (Cementos Mexicanos S.A of Mexico, LaFarge Group of France, and Holcim Ltd. of Switzerland) and the nickel sector (Anglo American plc of the United Kingdom). Many companies in the coal, iron, synthetic crude oil (including heavy crude oil), and steel (including hot-briquetted iron) sectors were owned by joint ventures of the Government and private sector companies, such as Kobe Steel Ltd. and Mitsui and Co. Ltd. of Japan (table 2).

China's state-owned and Japan's privately owned corporations were planning to invest in Venezuela. The Venezuelan Government announced that China was planning to invest $16 billion by 2012 to develop oil reserves in the country's eastern Orinoco Belt. China International Engineering Consulting Corp., China Petroleum and Petrochemical Engineering, and PDVSA were considering developing technology for crude oil refining and upgrading. PDVSA was planning to increase its output to about 4 million barrels per day (Mbbl/d) from its current production level of 2.7 Mbbl/d after experiencing cash flow problems and declining production in recent years. In 2009, China had extended a $20 billion loan to Venezuela for housing and infrastructure projects. The loan was expected to be paid back in crude oil shipments (Mendez, 2011; PennEnergy, 2011).

Similarly, private Japanese companies, such as Japan Oil, Gas & Metals National Corp. (JOGMEC), were planning to provide funding to a subsidiary of Inpex Corp. and Mitsubishi Corp., which, along with subsidiaries of Chevron and the Venezuelan Suelopetrol C.A., was participating in an extra-heavy crude oil development project on three blocks of the Venezuela's Carabobo area. The four firms had participated jointly in the bidding round for development of Carabobo projects, which was held in January 2010, and were awarded the contract for Project 3a, which would entail the development, production, and upgrading of Block 5, Block 2 South, and Block 3 North. The consortium was conducting a feasibility study with a plan to form a joint venture with PDVSA to produce about 400,000 barrels per day (bbl/d) of crude oil at the project. JOGMEC was planning to invest $40.2 billion once the joint venture was established. PDVSA was expected to take a 60% stake in the venture; Chevron, 34%; Inpex and Mitsubishi jointly, 5%; and Suelopetrol, 1% (Ministerio del Poder Popular para la Energía y Petróleo, 2010; Oil & Gas Journal, 2011; República Bolivariana de Venezuela, 2011).

Mineral Trade

Venezuela's economy has benefited from its mineral industry owing to the significant contributions the petroleum sector has made to its trade balance. In 2010, Venezuela's mineral exports amounted to $65.8 billion and included, in order of value, petroleum ($62.3 billion), and bauxite and aluminum, steel, cement, chemical products, iron ore, and other products ($3.5 billion). The country's leading export partners were the United States (27.3%), China (12.8%), Colombia (11.4%), Brazil (8.8%), and others (39.7%). Venezuela's imports amounted to $38.6 billion of consumer goods, machinery and transport equipment, manufactured goods, and construction materials. Venezuela's leading suppliers were the United States (20.6%), Colombia (17.8%), China (12.8%), Mexico (8.7%), Brazil (4.7%), and others (35.4%) (Banco Central de Venezuela, 2011; Petróleos de Venezuela, S.A., 2011; República Bolivariana de Venezuela, 2011; U.S. Energy Information Administration, 2011).

The United States remained Venezuela's leading trading partner. In 2010, bilateral trade amounted to $26 billion.

Venezuelan exports to the United States were valued at $20 billion (or almost 30.4% of total Venezuelan exports), and U.S. exports to Venezuela were valued at $8 billion (or almost 20.6% of total Venezuelan imports). The United States continued to be the leading customer for Venezuelan crude oil. Venezuela shipped an average of 1.1 million barrels per day (Mbbl/d) of crude oil and petroleum products to the United States in 2010, which accounted for about 50% of Venezuelan oil exports and 12% of U.S. oil imports (Banco Central de Venezuela, 2011; Petróleos de Venezuela, S.A., 2011; U.S. Department of State, 2011).

Commodity Review

Metals

Gold.—Most of the gold activities in Venezuela took place in the State of Bolivar. Canadian-Russian Rusoro Mining Ltd. (RML.V) was engaged in the acquisition, exploration, development, and operation of gold properties in Venezuela and operated as a joint venture with CVG Minerven. RML.V held a 95% interest in the Choco gold mine and a 50% interest in the Isidora gold mine, and CVG Minerven owned the remaining shares of each; both mines are located in the State of Bolivar. RML.V was interested in Las Cristinas gold project after the Government withdrew a permit for Crystallex International Corp. to develop the project, which is located at Kilometro 88 in Bolivar State. As of December 31, 2009, Las Cristinas had proven and probable reserves of 464.4 million metric tons (Mt) grading 1.13 grams per metric ton (g/t) gold containing 16,862,000 troy ounces, or the equivalent of 524.5 metric tons (t) of gold. In addition, Las Cristinas had measured and indicated resources of 165 Mt grading 0.73 g/t gold containing 3,899,000 troy ounces, or the equivalent of 121.3 t of gold (República Bolivariana de Venezuela, 2011; Reuters, 2011).

Mineral Fuels and Related Materials

Coal.—Carbones del Guasare (CdG) used the truck-shovel system to access about 175 Mt of coal reserves in the Guasare coal basin. CdG owned and operated the Paso Diablo coal mine, which is located in the State of Zulia in northern Venezuela and which produced about 7.5 million metric tons per year (Mt/yr) of thermal and metallurgical pulverized coal injection (PCI) coal. CdG was a joint venture of Carbozulia, S.A. (a 49% Government-owned company); Anglo Coal, which was a subsidiary of Anglo American (25.5%); and Peabody Energy Corp. of the United States (25.5%). Peabody marketed its share of the mine's production to customers seeking high-Btu, low-sulfur thermal coal for electricity generation and PCI coal to be used in the steel industry. The Mina Norte coal mine, which is located at El Brillante in the municipality of Paez, State of Zulia, was operated by the joint venture of Carbomar Corp. (64%) and Carbozulia (36%). The Government continued to express an interest in developing a coal-powered electricity-generating plant to supplement the national electricity grid, much of which was supplied by hydroelectric plants (Anglo American plc, 2011; Carbozulia, S.A., 2011; Peabody Energy Corp., 2011).

Natural Gas.—In 2010, natural gas production and consumption remained at about the same level as that of 2009 (28,000 million cubic meters and 29,500 million cubic meters, respectively); the difference between production and consumption appears to have been imported from Colombia. Most natural gas output was associated with petroleum production. According to BP p.l.c. and the U.S. Energy Information Administration, Venezuela has the second largest natural gas reserves (about 5.1 trillion cubic meters) in the Western Hemisphere behind the United States (6.1 trillion cubic meters). The petroleum sector consumed more than 65% of Venezuela's natural gas production in the form of reinjection to produce crude oil. Venezuela's most important natural gas projects included the Barrancas and the Yucal Placer Blocks. Since early 2008, the Antonio Ricaurte 224-kilometer gas pipeline, which connects western Venezuela to Colombia's Punta Ballenas area, had delivered between 2,700 and 4,300 million cubic meters per day of natural gas from Colombia to Venezuela; the flow of gas was to be reversed by no later than 2012 when Venezuela was to begin exporting more than 3,960 million cubic meters per day to Colombia, and that contracted volume was reportedly the pipeline's average flow in 2010 (BP p.l.c., 2011a; 2011b, p. 24, 27; Petróleos de Venezuela, S.A., 2011; U.S. Energy Information Administration, 2011).

Venezuela planned to increase its natural gas supply to cover domestic and regional demand, and the excess was to be exported to the world markets. Proposed natural gas projects included the development of the offshore nonassociated natural gas resources in the Plataforma Deltana area, which is located south of Trinidad and Tobago in the Atlantic Ocean; the development of natural gas resources in the Gulf of Venezuela and the State of Falcon; the construction of the Center West Interconnection Project gas pipeline; and the construction of the Gran Mariscal de Ayacucho industrial complex and the Mariscal Sucre LNG plant (Petróleos de Venezuela, S.A., 2011; U.S. Energy Information Administration, 2011).

According to Chevron, total daily production in 2010 from all Chevron's producing areas in Venezuela averaged 134,000 barrels (bbl) of synthetic oil and 3.3 million cubic meters of natural gas. That production came from three areas. The first was Boscan Field in the State of Zulia in western Venezuela and was operated by Petroboscan (an affiliate of PDVSA in which Chevron held a 39.2% interest). In 2010, Petroboscan's total daily production averaged 96,000 bbl of liquids and 0.4 million cubic meters of natural gas. In 2010, 15 development wells and two water injection wells were drilled. The second was the LL–652 Field in Lake Maracaibo. This field was operated by Chevron's affiliate Petroindependiente, in which Chevron was a 25.2% owner. In 2010, Petroindependiente's total daily production averaged 5,000 bbl of liquids and 1.5 million cubic meters of natural gas. The third was the Hamaca project, which was operated by Petropiar (a company in which Chevron owned 30% interest). The project was located in Venezuela's Orinoco Belt and had a total design capacity to process and upgrade 190,000 bbl/d of extra-heavy crude oil into 180,000 bbl/d of lighter value synthetic crude oil. In 2010, total daily production averaged 134,000 bbl of liquids and 1.4 million cubic meters of natural gas. In February 2010, a Chevron led-consortium was selected to participate in a heavy oil project composed of three blocks in the Orinoco Belt. A joint operating company, Petroindependencia, was formed in May 2010. Chevron held a 40% interest in the project, and PDVSA held the remaining 60% interest (Chevron Corp., 2011a, b).

The consortium of Chevron, INPEX Corp., Mitsubishi Corp., and Suelopetrol (40%) in joint venture with the PDVSA (60%) was scheduled to be supplied with gas from the PDVSA's Blocks 2 and 3, which are located in the offshore Plataforma Deltana region in eastern Venezuela. Chevron also operated the offshore Cardon III Block north of Lake Maracaibo in the Gulf of Venezuela, where Chevron started drilling an exploration well in the first half of 2010 (Chevron Corp., 2011a).

Petroleum.—In 2010, Venezuela's crude oil production amounted to about 986 million 42-gallon barrels, and its gross natural gas production amounted to 28 billion cubic meters. Venezuela consumed about 279 million barrels of petroleum in 2010. PDVSA controlled the country's petroleum sector through its wholly owned subsidiary CVP. According to BP and the U.S. Energy Information Administration, Venezuela has proven reserves of about 211 billion barrels (Gbbl) of crude oil (the largest in the Western Hemisphere). To increase crude oil refinery capacity in Venezuela, PDVSA planned to build new refineries by investing $18 billion to construct the Cabruta refinery, which would have a capacity to produce 400,000 bbl/d of extra-heavy crude; the Batalla de Santa Ines refinery (50,000 bbl/d of petroleum); and the Caripito refinery (50,000 bbl/d of asphalt). With these three new refineries online and improvements made to the country's existing refineries, PDVSA's processing capacity in Venezuela would be increased to 700,000 bbl/d by 2012. In February 2010, the Venezuelan Government announced the results of a bid process related to facility expansions. A consortium led by Repsol YPF S.A. of Spain had secured the Carabobo 1 project, and a consortium led by Chevron had secured the Carabobo 3 project. The second project, Carabobo 2, went unawarded (BP p.l.c., 2011b, p. 9; Petróleos de Venezuela S.A., 2011; U.S. Energy Information Administration, 2011).

In December 2010, PDVSA signed direct bilateral agreements for the development of several oil blocks in the Orinoco Belt, including an agreement with China National Offshore Oil Corp. (CNOOC), which was a leading Chinese Government-owned oil company and an offshore oil and gas producer in China. PDVSA announced a memorandum of understanding with CNOOC to develop the Boyaca Block 3. Other bilateral agreements for the joint exploration of the Orinoco heavy-oil belt included agreements with National Oil and Gas Corporation of Vietnam (Petrovietnam) for the Junin-2 Block; China National Petroleum Corp. (CNPC) for the Junin-4 Block; Italy's Eni for the Junin-5 Block; and a consortium of Russia companies for the Junin-6 Block (Institute of the Americas, 2011; Petróleos de Venezuela S.A., 2011; Woodrow Wilson International Center for Scholars, 2011, p. 6–8).

The Ministerio del Poder Popular para la Energía y Petróleo indicated that Venezuela had 1.28 Mbbl/d of crude oil refining capacity in 2010, all operated by PDVSA. The major facilities included the Paraguana refining center (940,000 bbl/d), the Puerto de la Cruz refinery (195,000 bbl/d), and El Palito refinery (127,000 bbl/d). Venezuela's CITGO Petroleum Corp., through PDVSA, also controlled significant refining capacity outside of the country (Petróleos de Venezuela S.A., 2011; U.S. Energy Information Administration, 2011).

According to BP, and in line with the Venezuelan Government's initiative, all exploration and production projects that were operated by privately owned companies under service agreements were incorporated into joint ventures. PDVSA's CVP held the majority share in each joint venture. BP Venezuela subsequently became a shareholder in two of these joint ventures (Petroperijá and Petróleos de Boquerón). BP also became a partner in the 110,000-bbl/d Petromonagas joint-venture project, which had gross reserves estimated to be 1.2 Gbbl of equivalent oil (BP p.l.c., 2011a; 2011b, p. 2–3).

Uranium.—Venezuela planned to produce uranium eventually from deposits located in the States of Amazonas and Bolivar, which supposedly contain about 50,000 t of uranium reserves. Russia and Venezuela signed cooperation agreements in the fields of crude oil exploration and nuclear energy and were planning to sign a 25-year intergovernmental cooperation agreement for crude oil and natural gas production and nuclear power generation (RIA Novosti, 2011).

Outlook

Venezuela is expected to remain a leading supplier of crude oil and refined derivatives to the United States. Natural gas will be incorporated into the country's energy supply, owing to future offshore gas developments in the Deltana Platform off the coast of eastern Venezuela and in the Paraguana Peninsula in the northwestern part of the country (Petróleos de Venezuela, S.A., 2011).

Changes in the Chinese economy, the growth of its manufacturing sector, and that country's need for raw materials, energy, and food, have sparked an unprecedented expansion of China's commercial and political relations with other countries of the developing world, including in (but not limited to) Latin America. The Venezuelan Government and the Industrial and Commercial Bank of China signed an agreement for the financing of projects and financial services in Venezuela. China had already invested $20 billion in the country, and in 2011 PDVSA was exporting 400,000 bbl/d to China, which was expected to increase by up to 1 Mbbl/d in the foreseeable future (Mendez, 2011; Wiggin, 2011; Woodrow Wilson International Center for Scholars, 2011, p. 35).

Although the country's nationalizations and uncertain macroeconomic environment could lead to further reduced levels of private investment, Venezuela has the largest reserves of crude petroleum in the Americas, which is more likely to encourage new investments from China, Iran, Italy, and Russia. Investment could include the construction of infrastructure to deliver crude oil and natural gas throughout the world, and could give Venezuela a significant advantage in marketing its petroleum and natural gas on a long-term basis. PDVSA's exploration and production plans are expected to encourage additional development of hydrocarbon resources in the Orinoco Belt and to increase the country's production of petroleum to 5.8 Mbbl/d by 2012, subject to the OPEC production constraints. PDVSA's plans to build new crude oil refineries at Cabruta and Llanos de Barinas (Batalla de Santa Inés) and to build an asphalt plant at Caripito are also likely to encourage the continuation of Venezuela's strategic alliances with other nations with strong economies, such as Canada, China, Italy, Russia, and other friendly countries, particularly in the crude oil, natural gas, and precious metals sectors. Development of Las Cristinas, which is one of the leading gold deposits in Latin America, could provide a welcome source of new revenue to Venezuela (Organization of the Petroleum Exporting Countries, 2010; Petróleos de Venezuela, S.A., 2011; U.S. Energy Information Administration, 2011).

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TABLE 1

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010[e]
METALS						
Aluminum:						
Alumina		1,892	1,900 [e]	1,900	1,900	1,900
Bauxite		5,928	5,500	5,500	5,500	5,500
Metal, primary, unalloyed	metric tons	610,000 [e]	610,000 [e]	610,000	578,000 [r]	355,000
Gold, mine output, Au content	kilograms	11,600	10,092	10,100	11,880 [r]	12,000
Iron and steel:						
Iron ore and concentrate:[e]						
Gross weight		22,100	20,700	20,650	14,900	14,900
Metal content		15,200	15,200	15,200	15,200	15,200
Metal, direct-reduced iron		8,400 [e]	8,400 [e]	8,400	8,500	8,500
Ferroalloys:[e]						
Ferromanganese		15,000	15,000	15,000	15,000	15,000
Ferronickel		57,000	57,000	57,000	57,000	57,000
Ferrosilicon[2]		92,000	92,000	92,000	92,000	92,000
Silicomanganese		35,000	35,000	35,000	35,000	35,000
Total		199,000	199,000	199,000	199,000	199,000
Steel, crude		4,900	5,000	5,000	5,000	5,000
Semimanufactures, hot-rolled		3,500 [e]	3,500 [e]	3,500	3,500	3,500
Lead, secondary, refined[e]	metric tons	30,000	30,000	30,000	30,000	30,000
Nickel:						
Mine output, Ni content[e]	do.	20,000	20,000	20,000	20,000	20,000
Ferronickel, Ni content	do.	16,600	16,600 [e]	16,600	16,600	16,600
INDUSTRIAL MINERALS						
Cement, hydraulic[e]		11,000	11,000	11,000	11,000	11,000
Clays, common		250 [e]	250 [e]	250	250	250
Diamond:[e]						
Gem	carats	45,000	45,000	45,000	45,000	45,000
Industrial	do.	70,000	70,000	70,000	70,000	70,000
Total	do.	115,000	115,000	115,000	115,000	115,000
Feldspar		200	200 [e]	200	200	200
Gypsum		7	7 [e]	7	7	7
Lime[e]		400	400	400	400	400
Nitrogen, N content of ammonia		1,160 [e]	1,160 [e]	1,160	1,160	1,160
Phosphate rock:						
Gross weight		400 [e]	400 [e]	400	400	400
P_2O_5 content[e]		115	115	115	115	115
Pyrophyllite[e]		30	30	30	30	30
Salt, evaporated[e]	metric tons	350,000	350,000	350,000	350,000	350,000
Serpentinite, crushed[e]		550	550	550	550	550
Stone, sand and gravel:						
Stone:						
Granite[e]		750	750	750	750	750
Limestone[3]		18,000 [e]	18,000 [e]	18,000	18,000	18,000
Sand and gravel		600 [e]	600 [e]	600	600	600
Silica sand[3]		500 [e]	500 [e]	500	500	500
Sulfur, petroleum byproduct[e]		800	800	800	800	800
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		60	60	60	60	60
Coal, bituminous		7,459	7,457	7,457	7,500	7,500
Gas, natural:						
Gross[4]	million cubic meters	35,100	32,100	29,200 [r]	27,900 [r]	28,000
Marketed[e]	do.	28,500	28,500	26,000 [r]	24,800	24,900
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	13,572	13,600 [e]	13,600	13,600	13,600
Liquid petroleum gas	do.	64,903	64,900 [e]	64,900	64,900	64,900
Total	do.	78,475	78,500 [e]	78,500	78,500	78,500

See footnotes at end of table.

TABLE 1—Continued

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:[5]						
Crude[4]	thousand 42-gallon barrels	1,024,920	953,745	933,670	889,505	985,500
Refinery products:[e]						
Liquefied petroleum gas	do.	7,000	7,000	7,000	7,000	7,000
Gasoline, motor	do.	85,000	85,000	85,000	85,000	85,000
Naphtha and other gasolines	do.	60,000	60,000	60,000	60,000	60,000
Jet fuel	do.	32,000	32,000	32,000	32,000	32,000
Kerosene	do.	120	120	120	120	120
Distillate fuel oil	do.	109,000	109,000	109,000	109,000	109,000
Lubricants	do.	1,200	1,200	1,200	1,200	1,200
Residual fuel oil	do.	90,000	90,000	90,000	90,000	90,000
Asphalt	do.	6,000	6,000	6,000	6,000	6,000
Petroleum coke	do.	10,000	10,000	10,000	10,000	10,000
Paraffins	do.	250	250	250	250	250
For internal consumption	do.	30,000	30,000	30,000	30,000	30,000
Unspecified	do.	1,000	1,000	1,000	1,000	1,000
Gains and losses	do.	2,000	2,000	2,000	2,000	2,000
Total[6]	do.	434,000	434,000	434,000	434,000	434,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. do. Ditto.

[1] Table includes data available through March 3, 2011.

[2] Production of 75% silicon-content ferrosilicon.

[3] Excludes production under contract with the Government.

[4] According to the BP Statistical Review of World Energy, June 2010.

[5] Includes condensate and bitumen for the production of Orimulsión®.

[6] Excludes byproduct sulfur, which is reported in the industrial minerals portion of this table, but includes losses.

TABLE 2
VENEZUELA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners[1]	Location of main facilities	Annual capacity
Alumina		C.V.G. Bauxilum C.A. (Corporación Venezolana de Guayana)	Ciudad Guayana, Bolivar State	1,800
Aluminum		C.V.G. Aluminio del Caroni, S.A. (Corporación Venezolana de Guayana and others)	do.	210
Do.		C.V.G. Venezolana de Aluminio C.A. (Corporación Venezolana de Guayana, 80%, and Showa Denko K.K., Kobe Steel Ltd., Sumitomo Chemical Co. Ltd., Mitsubishi Materials Corp., Mitsubishi Aluminum Co., and Marubeni Corp., 20%)	do.	430
Do.		Compañia Nacional de Industrias Básicas (Corporación Venezolana de Guayana, 100%)	do.	210
Bauxite		C.V.G. Bauxilum C.A. (Corporación Venezolana de Guayana, 100%)	Los Pijiguaos, Bolivar State	6,000
Cement		CEMEX Venezuela, S.A. C.A. (Cementos Mexicanos S.A. de C.V., 100%)	Barquisimeto, Lara State; Maracaibo, Zulia State; Pertigalete, Anzoategui State; San Cristobal, Tachira State	4,600
Do.		LaFarge Venezuela (Lafarge Group, 56.2%)	La Vega, Miranda State, and San Cristobal, Tachira State	1,750
Do.		Holcim (Venezuela) S.A. (Holcim Ltd., 85%)	Carupano, Sucre State, and San Sebastian de los Reyes, Aragua State	2,200
Do.		C.A. Fábrica Nacional de Cementos (Lafarge Group, 46.13%)	Palmira and Ocumare del Tuy, Miranda State	1,330
Do.		Cementos Catatumbo (Lafarge Group, 23.32%)	Montellano, Zulia State	650
Do.		Cemento Andino	Curcas, Trujillo State	560
Coal		Carbones del Guasare, S.A. (Carbozulia S.A., 49%; Peabody Energy Corp., 25.5%; Anglo Coal, 25.5%)	Paso Diablo, Zulia State, Guasare coal basin	8,000
Do.		Carbones de la Guajira, S.A. (InterAmerican Coal Holdings NV, 64%, and Carbozulia S.A., 36%)	Mina Norte and Cachiri, Zulia State, Guasare coal basin	1,500
Ferronickel		Loma de Níquel C.A. (Anglo American plc, 91.4%)	Loma de Niquel, Aragua and Miranda States	18
Ferrosilicon		Ferroatlántica de Venezuela, S.A. (Ferroatlántica S.L., 80%, and Corporación Venezolana de Guayana, 20%)	Ciudad Guayana, Bolivar State	80
Gold	kilograms	C.V.G. Compañia General de Minería C.A. (Rusoro Mining Ltd., 50%, and Corporación Venezolana de Guayana, 50%)	Isidora Mine, El Callao, Bolivar State	1,000
Do.	do.	C.V.G. Compañia General de Minería C.A. (C.V.G. Ferrominera Orinoco C.A., 66.77%, and Corporación Venezolana de Guayana, 33.23%)	Colombia and Union Mines. Caratal and El Peru plants, El Callao, Bolivar State	4,600
Do.	do.	Promotora Minera de Venezuela (Rusoro Mining Ltd., 95%, and Ferrominera Orinoco C.A., 5%)	Choco Mine, El Callao, Bolivar State	4,000
Do.	do.	C.V.G. Compañia General de Minería C.A.	Tomi Mine, El Callao, Bolivar State	1,500
Do.	do.	Revemin (C.V.G. Compañia General de Minería C.A., 51%, and Corporación Venezolana de Guayana, 49%)	Remevin mill, El Callao, Bolivar State	1,500
Do.	do.	El Callao Mining Corp. (Crystallex de Venezuela C.A., 80%)	La Victoria (Lo Increible), El Callao, Bolivar	200
Iron and steel:				
Iron:				
Direct-reduced		Siderúrgica del Orinoco C.A. (Cosorcio Siderúrgico Amazonia Ltd., 70%, and Corporación Venezolana de Guayana, 30%)	Ciudad Guayana, Bolivar State	4,600
Hot-briquetted		Complejo Siderúrgico de Guayana C.A. (Kobe Steel, 36.7%; C.V.G. Ferrominera, 17.4%; Tubos de Acero de México, S.A., 6.9%; Mitsui and Co. Ltd., Nissho Iwai Corp., Tomen Corp. and Shinsho Corp., 30.3%; International Finance Corp., 8.7%)	do.	1,000
Do.		Orinoco Iron (International Briquettes Holding, 100%)	Puerto Ordaz, Bolivar State	2,200
Do.		Venezolana de Prereducidos de Caroni (International Briquettes Holding, 100%)	do.	815
Iron ore		C.V.G. Ferrominera Orinoco C.A. (Corporación Venezolana de Guayana, 100%)	Cerro San Isidro, Los Barrancos, and Las Pailas, Bolivar State	13,000
Do.		Compañia Nacional de Industrias Básicas (Corporación Venezolana de Guayana, 100%)	Cerro San Isidro, Los Barrancos, and Las Pailas, Bolivar State	12,000

See footnotes at end of table.

TABLE 2—Continued
VENEZUELA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners[1]	Location of main facilities	Annual capacity
Iron and steel—Continued:			
Iron—Continued:			
Iron ore pellets	Compañía Nacional de Industrias Básicas (Corporación Venezolana de Guayana, 100%)	Ciudad Guayana, Bolivar State	3,600
Do.	Siderúrgica del Orinoco C.A. (Cosorcio Siderúrgico Amazonia Ltd., 70%, and Corporación Venezolana de Guayana, 30%)	do.	7,000
Steel	do.	do.	4,000
Natural gas million cubic meters	Petróleos de Venezuela S.A. (Government, 100%)	Processing plants in Anzoategui, Monagas, and Zulia States	35,000
Do. do.	Petróleos de Venezuela S.A. (Government, 60.8%, and Chevron Corp., 39.2%)	Boscan Field in Zulia State	310
Do. do.	Petróleos de Venezuela S.A. (Government, 74.8%, and Chevron Corp., 25.2%)	LL–652 Field in Lake Maracaibo	520
Do. do.	Petróleos de Venezuela S.A. (Government, 70%, and Chevron Corp., 30%)	Hamaca Project in Orinoco Belt	410
Do. do.	Petróleos de Venezuela S.A. (Government, 60%, and Chevron Corp.; INPEX Corp.; Mitsubishi Corp.; Suelopetrol S.A., 40%)	Plataforma Deltana in Lake Maracaibo	500
Nickel, Ni content of mine output	Loma de Níquel C.A. (Anglo American plc, 91.4%)	Loma de Niquel, Aragua and Miranda States	22
Nitrogen content of ammonia	Fertilizantes Nitrogenados de Oriente S.A. (Pequiven, 35%; Koch Industries, 35%; Snamprogetti International S.A., 20%; Empresas Polar, 10%)	Jose Industrial Complex, Anzoategui State	1,070
Do.	Pequiven (Petróleos de Venezuela S.A., 100%)	Petrochemical complexes in Zulia and Carabobo States	670
Petroleum:			
Crude[2] million 42-gallon barrels	Petróleos de Venezuela S.A. (Government, 100%)	Fields in Anzoategui, Apure, Falcon, Guarico, Monagas, and Zulia States	750
Do. do.	Petróleos de Venezuela S.A. (Government, 60.8%, and Chevron Corp., 39.2%)	Boscan Field in Zulia State	750
Do. do.	Petróleos de Venezuela S.A. (Government, 74.8%, and Chevron Corp., 25.2%)	LL–652 Field in Lake Maracaibo	2,200
Do. do.	Petróleos de Venezuela S.A. (Government, 70%, and Chevron Corp., 30%)	Hamaca Project in Orinoco Belt	800
Do. do.	Joint ventures with Corporación Venezolana de Petróleos[3] (Petróleos de Venezuela S.A., 100%)	Various locations	150
Refinery products do.	Petróleos de Venezuela S.A. (Government, 100%)	Refineries in Amuay and Cardon, Falcon State; Bajo Grande, Zulia State; El Palito, Carabobo State; Puerto La Cruz and San Roque, Anzoategui State	475

Do., do. Ditto.

[1] Reflects 2005 Government holding company structure and does not include the reorganization that took place after the formation of Compañía Nacional de Industrias Básicas.

[2] Does not include extra-heavy crude processing (synthetic crude).

[3] Includes crude petroleum production undertakings that formerly produced crude petroleum under operating service, risk-sharing, or profit-sharing agreements.

ISBN 978-1-4113-3175-4

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